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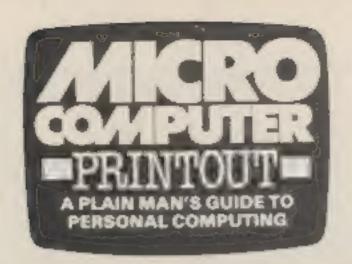




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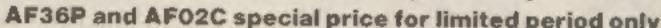
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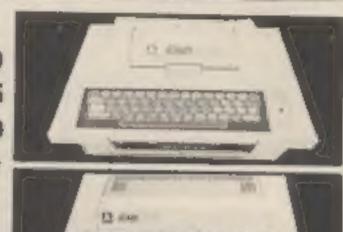


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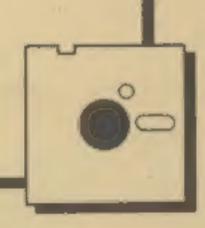
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M.C.P.

A Beginners Guide

"Don't plug Commodore" said the man from Commodore. "Write us an essay that people will find useful instead." It was an offer I couldn't refuse.

First things first then, Money. What do the darn things cost?

At Home

Anywhere between £70 and £7000. Maybe more. What you need spend is, of course, another matter. To a large extent you get what you pay for. But for a real computer that you can use at home the VIC-20 at £189 including VAT has to be a strong candidate. Why?

Colour graphics (assuming you have a colour TV) and a proper typewriter keyboard for a start. And sound. And plug-in program cartridges.

Budget another £45 for a cassette recorder to store your own programs; typing them in from



scratch everytime is a real pain. It is likely you will want to add some additional memory to the 5K of Random Access Memory (equivalent to about 5000 characters of text) the VIC-20 arrives with. That's because only 3K is actually available for programming. Plugging in an extra 8K RAM cartridge will make a £45 hole in your pocket – but it will allow you to play Space Invaders!

Other popular and currently available home micros to consider are the ZX80 at £73, and the Atari 400 at £345.

In the classroom

Schools have tended to opt for machines like the PET, the most popular choice, at £550 +

VAT for 16K version, or the more expensive Research Machines RS380Z. For this you get a built-in black and white screen, for giving upper and lower case letters plus graphics. As with all Commodore machines, the BASIC language – very easy to learn – is built in.

The other major plus is the software. Lots of it available from independent suppliers. Commodore even give it away free if you are a school. Or you can swap with other teachers.

In business

Advising businessmen on the right micro is tricky, so much depends on the quality of the programs. In fact some experts recommend looking for the program first. Fortunately for Commodore I can put hand on heart and say that no system offers a wider range of off-the-shelf business programs than the PET.

There are a few businessmen that get by with 16K of RAM memory and a cassette drive – but not many. A more sensible configuration would be 32K of memory and a floppy disk unit. Quite a few companies offer this specification including Apple and some of the new Japanese machines.



to Micro Computers

by C.R. Oppenheim

To give you an example of pricing the 32K PET with 337K bytes (characters) toppy disks costs £1390 + VAT. The Apple price would be similar but with much lower capacity disks. Add £395 ex VAT for a dot matrix printer and you have a pretty effective business system for around £1800.

A good sales purchase ledger package will cost around the £300 mark on the most popular microcomputers, perhaps twice this price on the others. Economies of scale you see

Word Processing

Word Processing is probably the single most popular business application, it is so useful for sending personalised letters and maintaining lists.

After looking at more expensive systems to chose a SuperPET lits larger screen giving melines of up to eighty characters long Keyboard layout is QWERTY like a typewriter, so my secretary's happy too

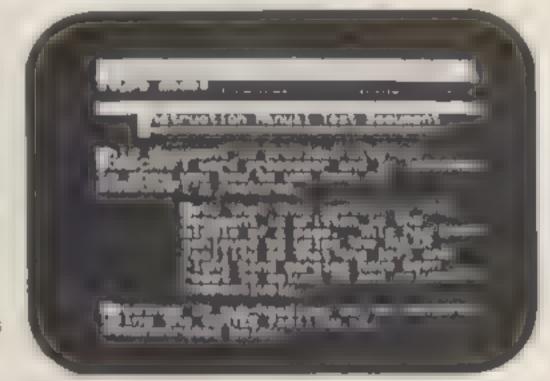
After the American WordStar, which runs on CP/M based machines, Wordcraft is probably the best known word processing

program, and at £375 + VAT it has the ment of being chear er. Alter careful consideration that is what i chose.

Whilst dot matrix printers, which as the haine's loggests create the letters out of duts, are fine for accounts, a typewriter quality printer is better for word processing. Commodore's new daisywheel at £850 + VAT looks, ke a bit of a bargain if you are feeling, ich you could pay £2000 for another make which would get through your letters even quicker.

Adding up the cost of a Word Processing system based on the 32K SuperPET with the powerful 1 megabyteid sks (they store 1 million characters approximately. The length of a Dickens nove.) the price comes in around £3000 + VAT. That's including the software

That's about all have space for for now. But I you have any queries idrop me all neiclo. Commodore. Or alternatively full in the coupon for further details and the name of your nearest dealer.





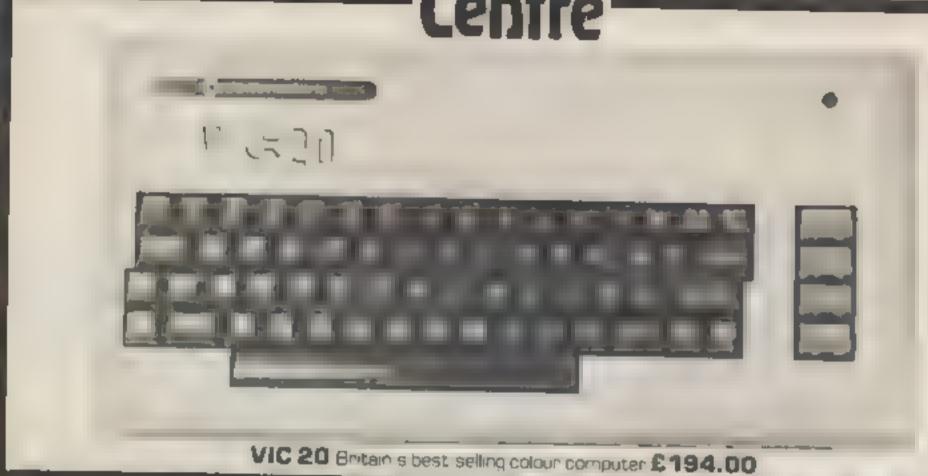
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CP/IVI Software

LANGUAGES

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HOW TO BUY A

BANKOFINGLAN



Spencer Hall concludes his series on Buying a Business System - with a look at Payroll, and gives answers to a few common queries

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tions by looking at all the pay slips for the entire year. But it's a holi of a lot easier_! print out a summary of all transac ions for that employee for the current tax year to date. You've not had to plough through 150 pay slips when there's one for each week of the year? Try a some bank holl-

Some payroll systems ofter the fac sty to infor all so that a computer E working and who s rin with a great living to key the infork mation in This can be very useful but employees may not trust a clock card they can't see so complete integration may generate union problems. A half way house where the clock card used by the employee read directly by the computer may offer a

more sensible solution. The erns : AP ar read the card, and the more y reads the corresponding Time to However, watch for man; a 1 1 1 es when entertaining ? ______ 4 in zion

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The only effective way to test out a program -- disks. Q E D

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payments were so big So look for some of the above points when evaluating a payroll program. If the program uce I mont then put it back on the shell - there are usually pienty of payroll programs to choose from

with not understand why his bonus

A number of queries have arisen as a result of this series which I will elaborate on as payrolls are not the most interesting thing to dwell on for two whole pages

Passwords

The first bone of contention is that of passwords. Are they really an effective deterrent or just an irritation for the authorised

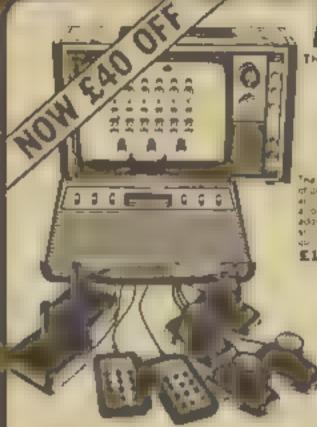
Passwords originally came in to prevent certain users gaining access to confidential information kept on the computers files. In a mainframe or mini computer netavation where all the likes may be accessible by any terminal at any time this is a valid constraint to stop employees finding out how much the boss gets paid. On a simple micro computer which only has floppy disk then passwords are irrelevant. How do you stop someone taking a peek (or poke, at a manual payroll? You lock it up Very simple Very effective. (Like Japanese car) Just do the same to your

Some people seem to get obssessed by the idea of one entry book-keeping ategrating everything into one heap T in certain problems in attempting this feet. The first is that it takes up tons of disk space - at least a M Byte which is more than many mic-

The second is that if you are a limited company you have to have an audit done every year on your books and records. Aud tors are lussy people and like to be able to see what has been going on in your business, during the year They will want to ensure that all transactions entered on the Nomina, Ledger have been authorised and not put there by just any member of staff. By posting entries across manually it enables accountants to scruhmise entires for obvious errors such as a barck of Thyoices which have been posted fwice.

While I agree that integration saves time it can be very dangerous from the control point of view and absolutely hideous if a serious clanger occurs in trying to straighten out the records retrospectively. So check with your lors first before spending the cash

 with that caveat, we end this series on How to Buy your Business System If you've realised just how easy it is to be misled by spec sheets and over-enthusiastic sales persons, then we've achieved our aim. Do write in with queries or just to explain your own expenences of buying a business system - your letter could help someone else avoid a disaster.....



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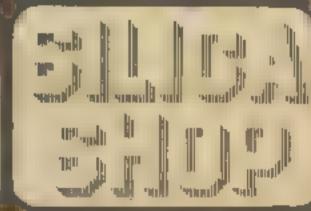


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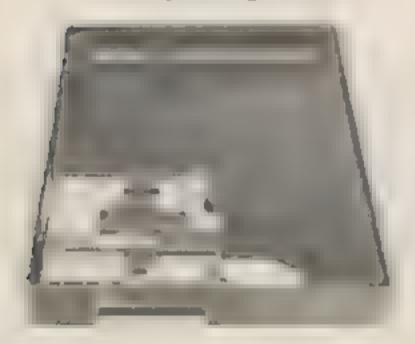
The tough ABS injection moulded plastic case measures 8" x 14" x 2½" and hooks up to your ZX printed circuit board in minutes. No technical know how or soldering is required.

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By removing the ZX PSU from its case this can also be fixed inside. We will carry out the installation work free of charge if required.

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INSTALLATION

Simply unscrew the ZX printed circuit board from ts case and screw it into the FD Case

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The ZX Centre, Sweeting Street, Liverpool 2. England, UK SAE for more details — Enguines. Tel. 051, 236, 6109.

Name Address City/State Zip

READ/WRITE

PET snaps

Can you or any of your readers, tell me about any ways in which a PET (mine is 8K old ROMs) can be used in connection with photographic entarging black and white and colour?

Peter Shale

Altea (Alicante) Spain

We are going to have to pass this one over to the readers, since we haven't yet heard of anyone using a PET for this application. Any one know better?

Here are a lew suggestions, though

- 1, One of the hassies of enlarging is the calculations that are involved sizing and scaling, exposures and filter strengths atc. Obviously a simple BASIC routine could help out tiere.
- 2) Why not use one of the off-the-shell database programs to catalogue all your negatives and prints? This would allow you to cross reference them under subject matter tocation and date etc.
- 3, if you don't mind tinkering with a soldering iron, it should be possible to link your PET directly to the enlarger (via the User Port) to perform liming and control directly.

Medical computers

I read with great interest your article on the use of computers in medical practice. I would like to bring to the attention of your readers of a book that I came across and have found usefu. I am a beginner in computers and this book introduces the subject in a very easy and concise manner.

The book is "Computers in Medicine An Introduction 1 Lobtained by copy for £10 from Medical Computing Co., Suite 10E, 860 Efth Avenue, New York, NY10221, U.S.A.

Dr. E. Denk. Beifast

Many thanks for the tip. Dr. Denk – we agree that books which successfully bridge the gap between computers and professions are few and far between

You may like to know there is a magazine with just such an aim called Practice Computing which is sent out free to GP's Any doctors interested should write to Paradox Publications, 39-41 North Road, London N 9DP

Inflated values

Many thanks for the publicity for my newsletter, which appeared in the April edition of Read/Write under Lateral Thinking Unfortunately a typo must have crept in somewhere the newsleiter is for 6800 users, not 68000

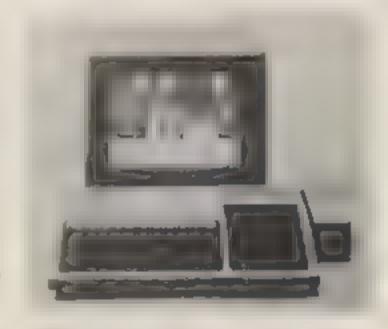
Much as I would like to be able to help the people who have written to me regarding the latter processor. I am afraid that such information is scarce at the moment.

T K Boyd Belmont School Feldemere Holmburg St Mary Dorking Surrey

Texas drawl

I liked very much your review on the TI-99/4A. It showed that the 4A is not the rubbish some other mags make it out to be. Can we have more articles on the TI-99/4A or 4 please?

l Scott Peterborough



BBC bashed

I read Guy Kewney's review of the BSC Micro in your June issue

I don't agree: the 88C Micro will fail for lack of after sales service. I have a small problem with mine – either the recorder of the cassette of the micro are uniterable.

The BBC refer me to Acorn

Acom gave me the names of my 2 nearest dealers, one 50 miles away in Canterbury one in Chelsea.

ophone Cheisea "Can I bring the 3 items in toria test?"

Answer – did you buy the Micro from us?

No – from the BBC. In that case we won to even test but only send the lot to the factory at your expense plus charges.

I would be without the equipment for at reast a month and face an uncertain bill

From Acomit also have a circular – conversion of BBC A to B can only be done by our dealers, cost £125

I regret I left for the BBC and promises which are not torthcoming. The BBC are only interested in entertainment inot businessike after service.

I forecast the BBC Micro will be a flop be cause of air this, irrespective of how good it might be

G. Mayer Orpington, Kent

Though many usets have written to us expressing satisfaction with the capabilities and value-for-money of the BBC Computer Mr Mayer yours is not the first complaint regarding servicing and repair we have heard

The bief history of the microcomputer has shown that one of the most effective things you can do is join up with one of the independent BBC user groups such as BEEBUG or LASE RBUG (see Holline), not only for technical advice, but also to accumulate some collective muscle with which to apply pressure to the manufacturers/sales organisations.

Anagram cracker

After keying in all 12K of "Anagram Cracker". I feel i must congratulate Bob Chapper and yourselves on two things, firstly, an informative program when compared with the popular space type ones and secondly while allowing for the very small amount of conversion to another machine, that it was correct informations well documented and was correctly printed. One of the lew magazine programs which ran first time after one necessary conversion was spotted.

The machine used was the JK101 using the CEGMON monitor new BASIC 1 3 4 and extra BASIC 5 and the following points may be of interest to other 101 users or anyone seeking conversion to other machines. The only major fault was in the statement in Line 70 in which S-T can result in 0 (zero) and LEFT\$(Str\$.0) is not supported on the 101 producing a 'trying to reference a hon-defined array error Adding a penultimate line of

68 IF S-T=0 THEN WS=MS+NS GOTO 75

will solve the problem.

For a 16 line display UK101, Line 420 should read

IF ROKIT THEN RETURN

and finally a few of the program lines were loolong and had to be split

The program will not run on the original BASIC 3 due to its string handling bugs but with the new Premier Publications replacement will create the look up tables in 70 seconds for a 7 letter word and 95 for a 10 letter word CEGMON and BASIC 5 support a fest Screen Clear and the GET \$ statements but they can be obtained more slowly by the original screen clear statement and keyboard input routine respectively. As a point of interest the file Saving Routines of the new BASIC 4 results in a LOAD time of 6 minutes at 300 baud compared with the 9 minutes of the original BASIC 4. (P.S. I get no commission from Premier Publications).

Finally thanks for an interesting magazine that does not try to talk down to BASIC users although knowledge of other ranguages is useful, and for information on a wide range of subjects.

N.L. Smith Stoke-on-Trent

All credit must go to Bob on this one, for a very well thought out program (several readers have commented on this listing). We do try however on all our listings, to avoid any program structures that would make conversion to another machine difficult

The UK101 is not a machine about which we receive a lot of correspondence – do we have other users amongst our readership? Write and let us know

READ/WRITE

The Editor welcomes your letters, but if you require a personal reply please enclose an S.A.E.



Intellivision 1

 am interested in starting computing as a hobby but with the number of machines now on the market the choice is bewridering

My main interest is for computer games. I have an intellivision TV game at the moment and it is into this field of computing I would want to venture

The graphics on my TV game are very good and I would like to know I there are any computers on the market which are equal to or better than the Interivision sort. For instance would the 8BC microcomputer give me the graphics I want?

Whiting
 Ne sea Bristor

The graphics on the Mattet Intellivision offer 16 colours on a resolution of 192 x 160 picture elements of 'pixels. Quite a few mic recomputers can offer comparable graphics including the Atan 400. Texas Ti99/4A, BBC A and B, and with limited colour, the Commodore VIC and Sinciair Spectrum.

We would point you specifically in the direction of the Alan and Texas, since both have been designed specifically for the home market—with a heavy bent on video games. Both have a good range of plug-in cartridges, and both have graphic commands which tacilitate writing your own games

Atari's system is called Player Missile graphics and allows you to create objects move them about the screen and detect collisions between them. Texas' version (which requires the additional plug-in Ti Enhanced BASIC) is called 'Sprite graphics and allows objects (known as Sprites) to pass in front of or behind others.

Intellivision II

I understand that Mattel are to shortly introduce a keyboard which will turn the Matter In tellivision Video Game into a full home computer. Could you please provide me with any details of cost, availability and technical appraisal of the resulting computer.

> G Robson Camberley, Surrey

The truth of this matter is that Mattet have been 'about to introduce a keyboard and BASIC language for the Intellivision video game machine for at least two years, and indeed, that promise has been a selling point for many owners. After all, the graphic capabilities and game-control handsets are superior even to Atan's V.C.S so the addition of a home computer facility would make it a very attractive machine.

Apparently, a keyboard has been released in the States at around the \$400 mark which would translate to £300 by the time a British power supply had been installed. Obviously this is too expensive to be a best seller, so our guess is that Mattel are developing a cheaper (say £100) keyboard plus BASIC unit – though it could be the end of the year before it arrives.

Meanwhile, there would seem to be a captive market ready and waiting for some entrepreneur or small hardware company to develop an independent keyboard. Any takers? would like to have this for its own sake. As understand it, however. I will also be able to incorporate" information from CEEFAX etc. into my computer programs. Is this correct?

presume I could replace my present TV with a model which incorporates Teletext or alternatively I could purchase the BBC Teletext Receiver (price £166) or some similar type of adaptor/per phera. Assuming there is little for or against the choice from the economic point of view, is there any advantage or disadvantage from the technical and operating point of view in choosing the BBC Teletext Receiver?

E. Commins Wilpshire, Nr. Blackburn

Yes, it would be very much more beneficial to purchase the Teletex add-on to the computer (assuming it gets to market that is), because this will allow you to make use of the information extracted from Teletext pages, in your programs

An ordinary Teletext TV set won't permit

Though you would need to write your own software, it should be possible to develop some quite sophisticated applications which make use of feletext.

One idea is a Portfolio Management System which alerts you to significant changes on the Stock Market. Of a program which uses sports results to predict the outcome of future games.

incidentally we would be very interested to hear from readers who have ideas for computer applications which involve Telefex also

Neater flowcharts

D Larder (Read/Write, June 1982) may like to know that the Linex brand of templates about which he enquires its wall known and widely stocked by drawing office suppliers (see Yellow Pages). The flowchart template to which he refers is "Electronic Data Processing Template", details as follows from the current Linex catalogue, prices from a local stock st

No 1175 symbols standard size (a PRO-CESS rectangle = 30x20mm), £3 75 + VAT No 1178 - symbols 0 7 x standard size (21 x 14mm), £4 65 + VAT

No. 1168 – symbols 0.5 x standard size (15 x 10mm). 63.55 + VAT

The symbols are described as SO 1028 BS ANSI, and appear virtually identical with those on the inmac template at £5.20 + VAT

D T Hartley Wilmslow Chashire

Teletext

 Intend purchasing a Model B BBC Micro for home and personal use

I do not have Teletext on my home TV and



Sumock

Manchester

microcomputer world

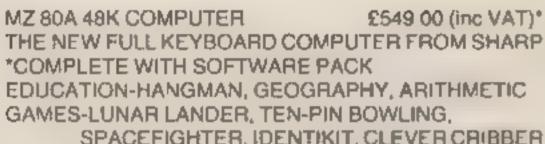
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First and foremost

MZ-BUA



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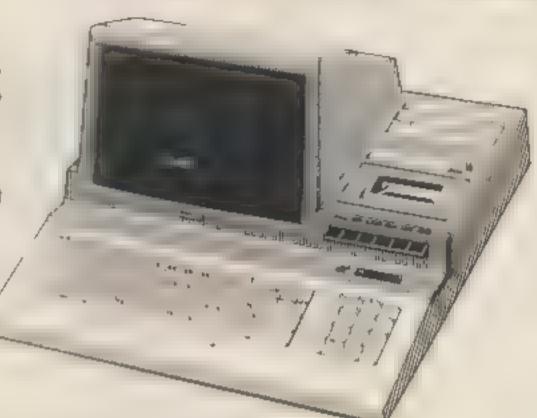


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- BASIC TUTORIAL 2
- BASIC TUTORIAL 3
- BASIC TUTORIAL 4



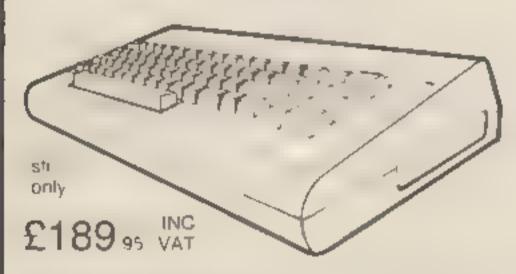
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This microcomputer comes with something no other can offer. The Xerox name.

The age of the microcomputer has only just arrived.

Rank Xerox, however, have been around for some 25 years, supplying and servicing sophisticated office equipment for many of the

businesses in this country.

The Xerox 820 frees you from administration, from figure-work, from all the time-consuming routines that impose on your day. And it will help you make informed business decisions by presenting a detailed picture of your operation. Information you can manipulate to chart the way ahead.

The 820 is a compact, versatile, easy-to-use, desk-top microcomputer. With its CP/M operating system it opens up a vast array of appli-

cations in software and language.

From our software catalogue you can select programmes to suit your needs whether they be word-processing, financial planning and modeling or data-management, plus a whole range of business applications.

You will have access to diagnostic help and assistance for both hardware and software.

Just ring the Xerox Help Line and there'll be a

Xerox expert to advise and assist you.

The 820's technical capabilities include:

1. Storage Options The 820 has a range of storage options from 54" and 8" disc drives, offering capacities of up to 1MB, to Fixed Disc with capacities up to 12MB.

2. Display Screen/Processor Display Screen: 23 lines. 80 characters per line. White on black background. Brightness control. Processor: 64K RAM, 4K ROM. Z80' processor using the universal CP/M[†] operating system.

3. Keyboard Nationalised 94 character with ASC11 keys. Independent cursor control and statistics key pad.

4. Printers There is a range of Xerox



printers available for the 820, such as the 630 which has: High quality 40 CPS Daisy Wheel Printer Bi-directional printing, choice of 10, 12, 15 pitch and P.S. Two matrix printers are also available.

5. Communications Port In-built RS 232 communications port for point-to-point communications and for link through a Communications Server to Ethernet.

The 820 is available through Rank Xerox Sales Offices, Xerox Stores and Authorised Rank Xerox Microcomputer Dealers.

RANK XEROX We give people time to think.

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Mighty Mini Maker Markets

Micro

At MicroComputer Printout, we pride ourselves on the currency of our newspages – after all, the microcomputer market is a rapidly changing field and one can I afford to be three months out of date, like most of the other micro mags. So imagine our horror when we discovered that we had missed one story by 25 years!

You see, according to the Digital Equipment Corporation (the Big Baron of mini computers). They invented the persona computer a quarter of a century ago. It had a colour graphic display, could play music and even had joysticks for playing video games. The kids just loved it.

Only two problems prevented DLC from pre-empting the Apple by 20 years. First, far from being a desktop machine the PDP1 needed several large rooms for accommodation and at an asking price of \$120,000 it was somewhat above the average family's means

Since DI-C have had such a long-standing experience of the personal computer business, why you may wonder, are they so late in branging their own micro to market?

"We aren't late," retorts DEC's Boston-based President, Ken Olsen. "We were just waiting until the time was right." And in case you thought our Ken was being somewhat less than candid, he graciously concedes that "until recently we've been too busy Now with the help of the economy we have the opportunity."

This broadly translated means "The future of the minicomputer market is looking extremely doubtful. So now that a micro market has been opened up by Commodors. Apple, et al., we might as well muscle our way into it." So exactly what impact are DEC going to make on the micro market?

Allow me first of all to introduce the four machines they will be bringing out at the end of this year. All are extremely well designed ergonomically, with free-standing low-profile keyboards, and compact high-definition. VDU's which can display 24 lines of 80 or 132 characters.

The computer itself with disk



drives is housed in a large floor standing box which can rest horizontally or vertically on, or indeed under, the desk. The internal design is modular, so that with the aid of the graphic self diagnosis program, any user should be able to replace a faulty component with no tool more sophisticated than a ballpoint pen Not that that should be necessary unce DFC will be offering a one-vear on site warranty, and a variety of different service contracts thereafter.

At the bottom of the range is the Rambow 100, designed to attack the IBM Persona. Computer With twin processors (280 and Intel 8088) the Rambow will be able to run any software written under CP/M. CP/86 and MSDOS, and can apparently automatically sense and switch between them as the applications program requires. Price starts at about £2,200 with expansion up to 256K RAM, 5Mbyte hard disk

and colour monitor all costing

The DF Cmate II is really an upgrade and restyling of their DF Cmate I and is aimed at the integrated (paperless²) office with word processing the main emphasis

The professional series (325 and 350) are based on DEC's own processor, the F-11, based on the PDP 11/23 which is found at the heart of more than a few mini computers. They even incorporate telephone management systems which can dist numbers and deliver or record digitised speech messages.

From where we stand, the specifications offered by DEC are almost irrelevant. What will count is the hardware and software back-up they offer, and the sheet weight they place behind the marketing.

Something for the future, perhaps, but well worth watching We'll keep you posted

C.A.D. for CP/M

*Designed by computers, built by Robots **Remember that ad?

Now you too can design cars, buildings, perhaps even robots, in the privacy of your own home

The sinister-sounding KGB
Micros of Slough have achieved
something of a breakthrough with
Micro Designer Managing
Director Sandy Saunderson says it
is the first real time computeraided design system running on
the industry-standard CP/M
operating system

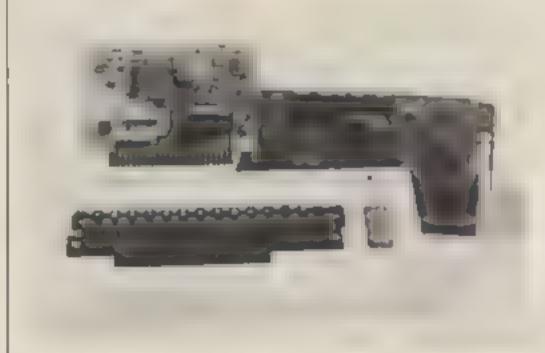
At £2 500 for the software it also cuts the cost of C A D in half

Using Micro Designer drawings are produced from instructions entered via the keyboard, or through direct feedback from the plotter, or via separate digitizer pad of any size. Full use of preprepared symbols (useful for circuit design if that is your bent) and part drawings can be made to speed up the creation of complete drawings.

A vector graphics screen is available for checking and editing parts of a drawing. KGB say first class drawings can be produced from the basic system without the aid of a hi res screen, though personally I shouldn't care to try

The KGB are headquartered at 14 Windsor Road, Slough, Berks Tel 38310 and ask for Boris

Mayday!



How's this for a mee, clear picture? The blurred object in the loreground is a Commodore VIC 20, the blurred object in the background is a standard ham radio transmitter/receiver. The crystal clear object in the middle is an interface between the two which is being sold by Computer World, Hilvertsweg 99, 1214. Hilversum, Holland. (Tel. 31.35-17633)

The idea is that it allows you to use VIC's keyboard to send messages – automatically Ifanslating text to morse code or RTTY as desired, or as Computer World put it: "Vec kaan now efen send prograams betveen ham radio ensus;asts!"

Electronic camel gets the hump

If the camel is a horse designed by committee, what is the NewBrain?

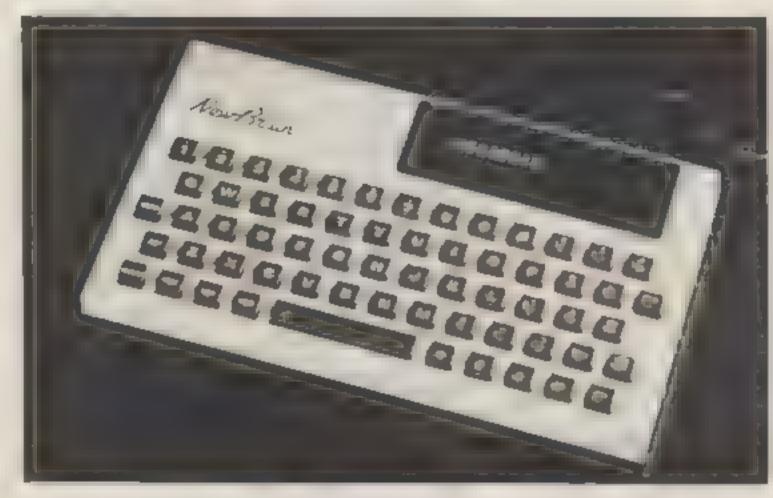
Grundy Business Systems have just relaunched the computer originally developed by Newbury Laboratories which, after acciaim for its innovative design promptly disappeared from sight

Now that the NewBrain is back the same industry insiders who applauded it two years ago are calling it a jack-of-all-trades and master of none

Developed originally by Newbury Laboratories (an NEB backed company), the NewBrain tooked ake a very clever idea at the time, just the kind of shot in the arm needed to revive the fledgling British microcomputer industry

A portable microcomputer well-constructed with a usable keyboard and 16-character display, the NewBrain was intended to run BASIC programs on the plane or train, and then plug into the TV at home or office for desktop power

Yet despite the fact that the NewBrain was the BHC's first choice for a machine to support their TV series - The Computer



Programme - the machine was so beset by design and production problems, that the whole circushad to be sold off to Grundy. Business Systems, specially formed division of a large beer. barrell concern. Meanwhile the

Now, two years after its original showing, and after "complete internal re-design" (Grundy's words), the NewBrain is being relaunched

Perusal of the spec sheet reveals one Z80A microprocessor, 32K RAM 24K ROM which includes a BASIC interpreter ("designed to emulate Microsoft with a bit more on top") and a very impressive screen editing system.

Model A costs £233 (inc. VAT). while the AD (which includes the 16 character display) costs £267-50. Both can drive a domestic TV or monitor, though the latter is recommended to take 1.1 advantage of the display facilities The screen can be software switched between 40 and 80 columns, and both are made very readable by the 8x10 dot matrix.

In addition to the block graphics (the New Brain's character set also includes the Greek alphabet for mathematicians, and a Chinese copy of the PET graphies), the NewBrain offers High Resolution as standard (A full technical and user evaluation is scheduled for the next (ssue.)

It is hard to see exactly which market Grundy are aiming the NewBrain at Without colour and sound, it is unlikely to appeal to home users. There is a market in schools for a medium-priced physically compact unit that's good for programming. The NewBrain also scores well on communications with two high speed RS232 ports for connecting to modems, printers, etc., and plans for a networking system to a.low several NewBrains to share common peripherals

But Grundy's heart seems set on the business sector - and already they are signing up OEM deals - notably one with pharmaceutical giant, Vestric, who will use NewBrains as order entry devices in retail. disponsaries.

The problem is, however, that NewBrain's real strength - its portability - is nullified by the fact that it needs a mains power. supply Though a £60 battery pack will be available shortly, it will only supply one hours' worth of power - enough to get you bonie' or as Grundy put it "see you. through a power cut'

Once a proper battery power supply, and a range of quality applications programs become available. NewHrain could be a winner - until then we would place it firmly in the 'also ran'

VICar's delight

I have to say that raffles, feter and bazaars in aid of Church Hall renovation funds aren't exactly my cup of tea. Not for me the dubious pleasure of fighting with one's neighbours to buy back the same junk you gave away last year, al to make the financia barometer at the entrance gate climb a couple of mill imetres!

But I have to admire one Mr. (Rev?) Clayton of 15 Meadowscroft, Euxton, Chorley, Lanes, who an order to raise money for his church hall has taken to selling VIC programs For £9 95 you get 18 programs covering such secular subjects as Hangman, Killer Comet and Betting. Write for more details



Word processing on the cheap

Can somebody picase explain why word processing programs are so expensive?

It can t be lack of competition Surely someone out there thinks there is room for an nexpensive word processor that really works?

OK I know there are a few of cheapon about, but the ones I have seen suffer such severe limitations that you end up junking them after a couple of hours. And I won't even mention the question of accumentation

On second thoughts, I will By and large it is atrocious. The Wordstar manual is positively impenetrable in places. Lots of places. And this the best selling word processing package in the world.

A ray of light has appeared on the horizon however. Two rays to be precise

Ray number one is Wordform is PF T/CBM word processor that performs 90% of the functions of the expensive programs according to author Ted Landsier. (I think he is talking about Wordpro and Worderaft). It is entirely written in machine code – so no hanging about – and it costs a modest £75 plus VAT.

Landsler says he designed it to present the islusion of a fixed page of paper viewed through a window which is moveable across the length and width of a page. Entering text Wordform simulates the action of a typewriter, whereby the cursor position remains fixed and the page advances across the screen. Clever idea when you think about it.

But if you want to get reath clever. Landsler has a new program called, not unreasonably Wordform II It excels at banching blocks or columns of text

A column of figures can easily be moved wherever it is required which should appeal to the more creative accountants amongst you I was also intrigued to see that one block of text can be overlaid over another. Wordform II still costs half the price of the competition. That's to say £150 plus VAT.

Landsoft do a useful brochure which you can get from them at 28 Sheen Lane, London SW14. Te 01-878 7044

Not so silly buffer



It isn't much good computers getting faster and faster when printers are getting slower

Slower? Well, yes. Last year a printer capable of producing letters of typewriter quality was so outrageously overprised that sensible folk settled for a matrix printer, capable of hammering away at a fair old rate.

Nowadays, as students of our 'Cheapest Daisvwheel' column will know, a letter quality printer can be had for £600 or is it £500 now? But however pretty the output, few of these printers could be described as tast.

The answer is an intelligent data buffer with enough memory to store whatever it is you need to print, so that you can get on with some computing at the same time as the printer hammers away.

It is true that some printers do provide some data buffering of their own, but usually only enough for a few lines

I rather like the look of 3D's Universal Data Buffer. It has its own 8-bit microprocessor and a static RAM buffer that can store up to 8K worth of characters. Data can be input or output in either serial (RSP32C) or parallel forms.

It costs £250 from 3D at 18/19 Warren Street, London W. L. Tel-01/367 7368

74,000 million year code

The dongles could be back on the drawing board by the time you took the

For the unimitated, a dongle is a protection device that is

supposed to prevent program

I say 'supposed to because the ingensous John Chew of Kingston Computers has found a way of circumventing the dongle. His motives are entirely honourable, he assures me. And indeed Kingston are now producing their own souped up dongle system called Secure.

It consists of a slim encryption key which plugs into the parallel user port of the computer, a pair of cassette programs – one for the various models of the PFT and the other for the VIC 20 – and a simple manual Secure costs £39.95 + VAT from Kingston at Electricity Buildings, Filey, North Yorkshire Tel 0723-514141

Chew calculates it would take a PFT 74 000 million years to crack his encryption key. I bet some crafty programmer will do it in half the time.

Cool it



Is your Apple hot and bothered?

A cool and soothing Applelan could be the answer. Not only will it prevent your chips from frying, and boards from baking, but it will discreetly dispose of the spaghetti junction found at the back of even the best mannered Apples.

Data Efficiency of Finway Road, Hemel Hempstead can kit you up for a cool £68 88

House of cards

Desperate Dave Tebbutt sat in his bunker surrounded by 64,000 fring cards. He looked worried

"I think the cat is under there somewhere," he said pointing to a pile of cards large enough to have concealed a small hippopotamus. Have a seat."

This was the reheatsa of the Cardbox launch and clearly things weren't going we'll

I think I shall dismiss the graphic designer" muttered Dave through his beard. Cheered up by the prospect of the firing of the author of the 64,000 card idea. Dave gave me a demo of the Caxton Software Pub ishing. Company's second publication.



"Cardbox is best described as an electronic card index system in that it displays individual records on the computer screen in a cardlike way," he explained

And so it is. The Cardbox program acts like a sieve, sifting through all the records until it sifts out all but the ones that match your precise requirements

In a few minutes we had an embryonic library index up and running "Let's find ali the books mentioning sex in the title suggested Dave helpfully. The system duly displayed details of Chicken Sexing for Profit and Pleasure published by Newney AutoGuides, Bognor, 1958. Critical Evaluation. Negative Cross reference to Poultry Farming and Genetic Dysfunction. Home

Database snobs may wish to reserve judgement on Cardbox. But I think it is a winner. For one simple reason. It is the first information handling program I could understand, and the manual's a model of fueldity too.

CP/M users will find it at their dealers price at £155 + VAT Contact Caxton at 10-14 Bedford Street, London WC2, Tel. 01-379 6502(1) for the name of the nearest one.

If you ask for details Desperate Dave will send you, amongst other things, a list of 101 uses for Cardbox Look at Number 89 and you'll discover what happened to the cat

Mailshot madness



If anyone can be said to have sourcd relations between humans and computers, it has got to be Readers Digest

Week after week their mighty IBMs despatch malaons of pages of unsolicated but deeply wonderful offers, each unsubtry personalised with the names of the ucky recipients

Encouragement is the last thing

they need, you would have the next But no. Apple Corporation have signed a two year co-operation agreement with Readers Digest

Apple will provide computer training and technical support Readers Digest will write educational programs

Post persons have been warned.

Instant recall

At the risk of further ribbing from the technofreaks on our staff. I would like to tell you about the most useful program I use. It is what you might call a very tiny database, although said technofreaks naturally insist that it is no such thing

Most popular microcomputers are supported by a variety of plugin ROM chops offering extra BASIC language commands and the like

The Daddy of them all was the Programmer's Toolkit for PET which is still available from Zynar's dealers, starting at £39 + VAT Many of these utility chips offer a 1ND or proving

Type FIND WOZNIAC on the screen and a mutue hants right through the program currently in the RAM memory, and displays on the screen any lines containing that string of characters

Since FIND will hunt for any string, you could equally easily demand that the computer FIND WOZ, with the same result Naturally if a Mr WOZZAT also featured in the listing, his name would be scouted out too in

response to this request

As a journalist, I have a large list of contacts, to whom I spend much of the day gossiping, this is known as investigative reporting Keeping a written addressbook up to date and legible is not easy

My program consists of a series of lines I ke

100 MAR ITN LEGIESS BANKS INFOMATICS 0. 439 4242 IOURNALIST

Details of the wondersonne could be recalled by typing FIND BANKS, 1 E GLESS.
INFOMATICS or if I wanted a list of all hacks, JOL RNALIST

Sophisticated Non Useful?

Homework Eliminated

This acronym business is really getting out of hand. First we had BASIC, which we were persuaded stood for Beginners AI -purpose Symbolic Instruction Code, the resome joker decided that PF I meant Persona. Factronic Transactor. Now a press release has landed on my desk ringuing, would you be never FIASCO (Fully Interactive Algebraic Symbolic COmputing).

Now once you've got over the name, FIASCO (which costs £80). FVAT and is available on cassette or disk for all PFT modess), is a very interesting product. It is really a programming language which handles algebra, expressions rather than pure numbers. As the screen picture shows, subscripts and powers are shown correctly.

Aimed partly at the education market, FJASCO could be every schoolboy's dream come true inconger need you be bogged down in quadratic equations, integration and polynomial expansions.

The designer assures me that the main use as a teaching aid or for professional use in approximate analytical solution of non-inear differentia equations."

Personally, I think he has invented the long searched for ionsework c initiator'

Schoolboys of all ages are directed to: MacM cro Ltd Beaufort House Shore street Beaufy Inverness, Tel 0463 712774



Tomorrow has been cancelled

Ahom! A slight problem has just

According to the Datapoint Corporation, an illustrious body, of whom more anon—the micro revolution is about to be cancelled Ditto the Electronic and Paperless offices. Even the Office of the Future could be under threat

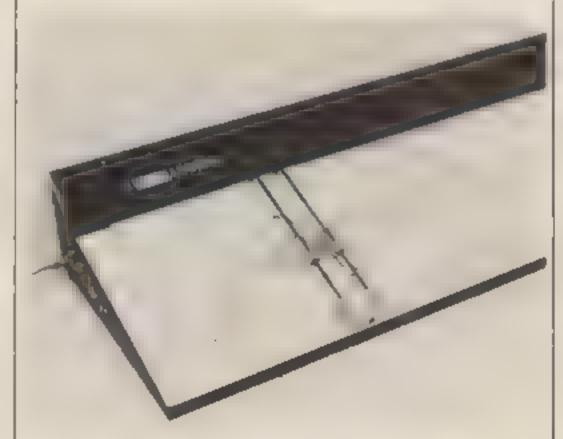
The officulty it seems, is that executives are not prepared to use keyboards. According to Datapoint's international and very expensive researches, the modern executive considers himself above typing.

In case you find your credulity strained by news of this sudden burst of status sensitivity. I should perhaps explain that Datapoint are in the business of selling alternatives to keyboards

Indeed, release of these findings co neides with the launch of a new pen-shaped stylus and pad for use with their colour graphics systems

Marvellous what a bit of careful research will revea.

Danger Boffins at work



There is a theory that computer manufacturers always highlight the machine's weakest features in their advertising

A curious example of this surfaced in promotional material from Linton Computers this month. The press release was headed 'New Graph Digitiser has switchable resolution of .5 and Imm'

Now, as graph digitisers go, this is not brilliant resolution. But reading on I learned that the new device is "by the far the most economically priced instrument of its type."

But you will have to ring Linton on 0223-892656 to ask the price as they forgot to include it *

"OK you guys, it is £186? + VAT. In the great tradition established by The Cheapest Darsywheel in the world" we shall now no doubt be immediated by news of even cheaper graph digitisers.

Sirius reads typewriting

Visitors to last month's Hanover Trade Fair gazed in awe as typewritten tetters fed into a document reader appeared on the screen of a Simus 1 computer

London dealers Zenithplan had bitched a Mi sur document reader to a Strius running the Wordstar word processing program. The contents of each typewritten sheet appeared on the computer's screen pretty well instantaneously. The act of transmitting data to the Strius patematically opened a file under the Wordstar program, so the original document could be man pulated in the same way as any other record.

At present the system recognises up to seven different typelaces including many of the IBM gu fbads. For more details contact.

/ criss at 2-10 Capper Street, 1 andon WC1. Telephone 01-636.
5304

We have been toying with the



idea of computerising a lower records for some time. The principal drawback for us is of doctors and many businesses, was the need to key in so much old material. Zenithplan's system. could neatly overcome this difficulty

Once stored on the Situs the data could be sent to any other computer with a communications link, and at a lower cost than using a document facsimile system.

Zenithplan have themselves taken the process a stage further by successfully interfacing the Simus to a Compugraphic typesetting/composing machine and are aiming the whole system at book publishers and other large scale word merchants

Theoretically there is now no reason why this column, bashed out on my trusty IBM golfbab is home, should not be read into the office Strius, sub-edited by the fiditor to remove the libelious bits, and then sent direct to the type-setter.

Dunno what the union word 1 think though

The BBC News

Since the curse of Hotline that strikes all publications piugged here, appears to have powered down for the summer, I'll take a risk. Two risks risks in fact

The first is to tell you how much Hiked Laserbug, the journal of the London & South East Region **BBC Microcomputer Group** From it I learned that if a BBC machine goes wrong you have a choice of taking it to a local service agent or returning it to BL Marketing However, the local service, gent will only repair it if the cost is less than £10 (parts and labour), as this is the most that BL will reimburse him for Sending at back to BL in Kettering results in them forwarding it on to Acomin Cambridge Laserbilg thinks the situation is far from sat sfactors.

A subscription costs £12 for 12 asses from 4 Station Bridge, Woodgrange Road, Forest Crate London E 7

The second journal to be put at risk by my recommendation is VIC Computing which I preud guilty to having had some part in the founding of 1t is now editted by the est mable Dean's Jarrett, the reas author of our mlarious Cray I Benchtest last month

Essential reading for VIC owners and anyone considering the purchase of one VIC Computing costs £6 for a years subscription from Paradox Publications, 39-41 North Road, London N7 Telephone 01-607 9489

demo on 01-952 0526. Or ring Rose direct in the van on 11 882

I still think he ought to pass a drawing test!

Wot, no micro?

An alarming revelation from a tell by micro back – "We con t actually use computers, we only write about them" – prompted a micro-census of our office

On the Editor's desk codergoing the sort of tests for which you need letters after your name the Sinchan Spectrum (thumbs up) and the New Brain (Jack of all trades, master of none). In the editorial 'Out tray an Atam 800 (great graphics danno about bus ness though), and, lurking under a sandwich the pocket sized Sharp PC 1500 (scientifical y sensible).

Meanwhile the ravishing redbiared Wendy is handing out serious punishment to the Lantotype CR Transc computer typesetter (the best there is) on which these pages are set

The only evidence of Pam's presence are two feet sticking out from under the Obverti (swful) word processor, and the occasional muffled oath

My own desk is straining under the weight of the ACT Sirius I (State of the Art) on which I am grapping with their "very user friendly" SELECT word processor. There is also a PET 4032 on which I have a tiny database, of which more anon

Oddly enough it is the advertising department with their CBM/Silicon Office (superb) installation whose numbers crunch most smoothly

The only white coat in sight classife Trader weats camouff feet for "security reasons") is Tomoty's, at least it was white antil it cot covered in a few pints of Taylors story, and

Formmy currently has an IBM
Personal Computer
(s. businessible) spread out all
over his Tips, which is not is
painful as it sounds. It is rumoured
he is hunting the celebrated

1±10= 001" bug

The Art department are reviewing a bizarre new VIC 20 (sove/hate/love relationship) program called SUBSPACT STRIKER from Pixel. They have now been reviewing of a large six weeks.

Subscriptions are handled by an ICL2960 (not user friendly and not ours) whilst an IBM 360 (unspeakable) keeps our distribution under what is laughingly known as control

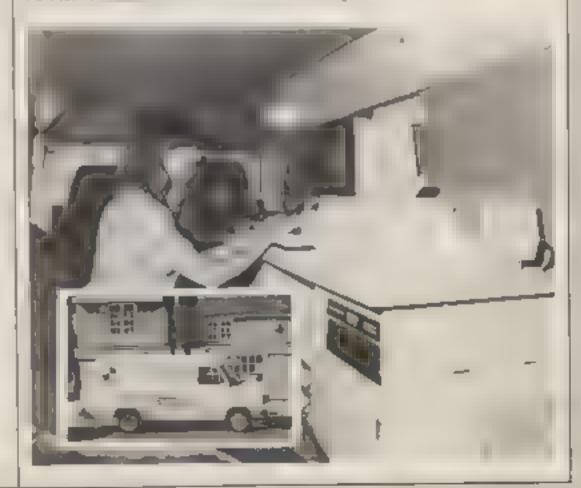
Next month. The saga of the Editor's eyeshade. Apple's answer to the IBM P.C. and where Forming put the Tandy pocket computer.

Computer on wheels

I was practically run over by a computer last week. The guids party was Jeterny Rose driving Da Visca Computers mobile. Jemonstrationment

Rose visits potential customers in the London area with the van Inside there is a telephone, a Commodore 8032 with 8050 (win disk drives, daisy wheel and dot matrix printers. And a bat

If you are thinking of buying a business system, and are not a



Rent-a-program from the Software Bank

"Good morning. I would like to rent a financial modelling program please."

Certainly ser MicroModelter is very popular. Would you like it for one, two or four weeks.

This conversation is not as far tetched as it sounds because or July 1st the Software Rental Bank opens for business

Once it does you will be able to test out programs before you buy should you decide so to do, the so itware Renta, Bank will waive the hire charge.

It is a mystery no-one thought of the idea before David Chesney Flere's how it works. Membership costs from £30 depending on how iong you want to keep the program. The rental fee is 20% of the program's price

Chesney reckons to spend too 100 stocking up the Bank with programs ranging from best-sellers the Wordstar and DMS to more controversial reseases like The Last One. They will kick off with 140 Apple II programs, and will add packages for the ACT Sanus I, IBM Personal Computer and North Star Horizon.

Membership det ils from 58 North Street il cichton Buzzard Bods

Heaven & Hell

Wherever computer folk gather it is seldom long before they begin telling jokes. Regular readers will know that my colleague, Rex Malik is compiling the Official Computer Joke Book

If you have heard a good one write and let us know. I will send a copy of the book to the author of any we can use. Here is my entry

You know the difference between heaven and hel?

Heaven is where the British are the policemen, the French are the cooks, the Germans are the engineers, the Italians are the sovers, and the Swiss organise everything That's Heaven

He his where the Brit share the cooks, the French are the engineers, the Germans are the policemen, the Swiss are the lovers and the Italians organise excrything

OK I know it didn't have anything to do with computers Let's hear yours

Free computer

It is not so long since I was offered free insurance if I bought a particularly nasty brand of computer

Now they are giving computers away free with insurance. Or at least an outfit called Floancial Planning is

Take out a Norwich Union life policy with a month, y premium of £25, and F.P. will present you with a VIC-20 - gratin

They will probably insure it for you too. Tell Wentworth 21/52 for the full S P

Make VIC butch



This sin ster leather-took device turns the VIC-20 into a 32 k computer. So what you might think. Memory expansion boards have, after all, been around for some time.

Stack's Storeboard is rather more than that. It lets you add memory as you can afford it. Plug in a row of four chips and presto! You have another KK of RAM Stack are currently quoting £29 for 8K, which is a lot less than the last lot I bought, and could well fall further.

The Stereboard also has a

socket that accepts games ROMs or any of the VICKIT series of ROMs that offer graphics commands and programming aids It you already own a memory expansion cartradge, you can plug that into the expansion port at the back

The Storeboard with 3K (high resolution graphics) RAM already fitted costs £49 ± VAT from VII dealers

Clever people. Stack, but I am not too sure about their taste for brack leather.

Keen on Corvus

Since about 95% of business correspondence is written on AJ paper with the short ends horizontal, you would have thought most computers would have adopted a similar form for their screen dispress.

But no, the CRT is almost invariably positioned long sides horizontal like a domestic television. Even in the market for dedicated word processors the vertical format is an exception.

In this and many other tespects. Corvus have chosen to ignore conventional wisdom and go their own route. The TV screen can be turned either horizontally or vertically.

Take the question of processor, for example. Whilstalmost everyone else is busy tumping on the 16-bit band wagon. set rolling by IBM and Sirius Corvus say they have opted for a 32-bit processor. But have they? We understand that the processor is the Motorola 68000, which I would call a true 16-bit chip. Floppy disks, now considered standard, receive similarly short shrift and are dispensed with altogether, in favour of 6, 10 or 20 megabyte hard disks (Corvus history as a supplier of hard disks for Apple may have something to do with this decision).

Keen Computers, one of the original Apple distributors in this country, are handling the Concept here. Dr. Tom Keen thinks sales will initially be to companies wanting a stand-alone desktop.



computer The design however allows it to be upgraded to a full Omninet local area network (see January issue for the State-of the Art report on Networking). Up to 63 Concepts can be networked to disk servets of up to 80 megabytes each, and a variety of peripherals.

Software details are a little sketchy at present, although Pascal and FORTRAN compilers and a CP/M emulator are all being mentioned

Probable price £3500 to
£4000 for the basic system, which
includes 256K of RAM. The 6
megabyte hard disk will cost
another £2400 or so. Keen say the
Concept will be available in July
Details from them at 5 Giltspur
Street, London E. C. 1. Tel. 01.236

Typing

By Bob Chappell

A useful program that will improve your typing speed and keyboard accuracy

if you relike me and only type with two fingers, then this program could help to turn you into a high-speed touch typist! It is a simplified set of typing exercises chosen to help you develop your dexter ity on the keyboard.

The program commences by asking you whether you diske timings given after each portion of an exercise (there are len exercises, each consisting of several parts) or after completing one whole exercise. You may then select from any of the ten exercises although they are best worked through in order. Having selected an exercise you will be shown which keys the exercise is centred on and which figures operate which keys.

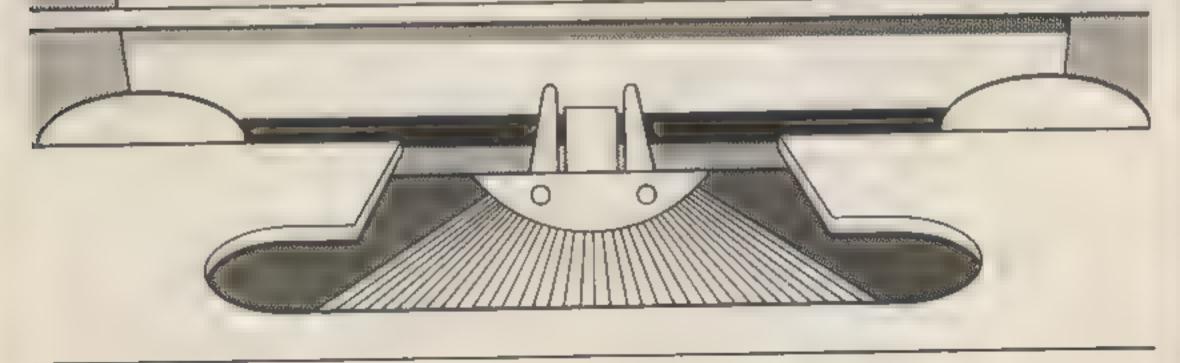
Each portion consists of displaying text on the screen and waiting for the typist to enter it exactly as shown. Wrongly typed letters are not displayed but a record is kept of the number of mistakes. A record of the time taken to complete the text is also kept. It so selected an approximation of your typing speed, together with the total of mistakes made is displayed at this point.

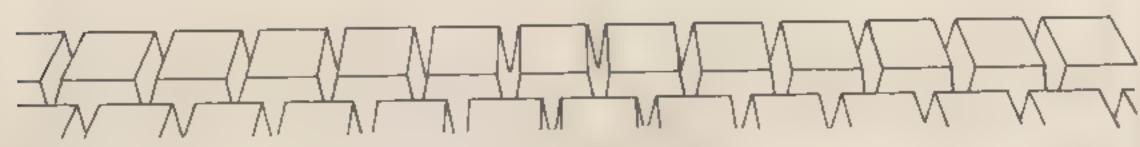
On completion of an exercise (following display of speed and total mistakes if selected for this point) you can elect to go on to the next exercise repeal the same exercise or select any exercise.

The program only covers practice on let ters and space since the majority of mic

recomputer keyboards have the norma-OWERTY layout but vary in their positioning of numbers and punctuation marks. The user can easily adapt the program to include this facility. Each block of DATA statements cov. ers one exercise. The first four lines in each of the blocks are the exercise number, the let lers being practiced the "linger codes" and the number of portions in the exercise. The "linger codes" are a numeric representation of which fingers type which keys, the left hand lingers are coded 1-4, going from the index finger to the little finger, whilst the right hand is coded from 5-8, again going from the index to the little finger. Thus a code of 4357 would represent the little and third lingers of the left hand, and the index and third fingers of the right hand. These codes correspond in order with the letters being practiced, e.g. FDFGHJ and 221155 indicates that E and D are covered by the middle finger of the left hand. Fland G by the index linger of the left hand and H and J by the index linger of the right hand. The thumbs are not coded but you are reminded in the displays that the right thumb is used to operate the Space Bar

Lines 110-150 cause the selected text to be centralised as near as possible, on the screen and were designed for a 40 column screen. If your screen is a different size merety substitute a lower or higher number for 30 depending on whether you have a har rower or wider screen. The program uses a





```
A REM **TYPING PRACTICE**
20 REM **808 CRAPPELL**4/4/82
30 GOTD: 690
40 REM **PIND EXZRCISE**
50 IPS-150TO70
60 FORJ -- TOS-1: READEX, FL$, FP$, M: FORJ1 -- ITOM READES: MEXTJ1, J
70 GOSJB.4EG
80 REM **PRINT EXERCISE**
90 TS=0:TT=0:TL=0 PORJ=1TON PRINTTS:PRINTUS:PRINT:PRINT PRINT:PRINT
100 REM **CENTRALISE TEXT ON SCHEEN**
130 PRINTAS: PRINT: PRINT
140 FORK= (30-L)/2TO.STEP-1: JFK clines 160
150 PRINT' ", NEXTE
160 SC=0:BT=TI:FORJ.=1TOL
170 GETBS: IPBS=**GOT
180 [P86<>MID$(A$,31,1)THEML=L+1:50+50+1-GOTO170
190 PRINTES; INEXTJ: FT-T]-BT TI-TT-FT:TE-TL+L:TS-TS+SC:1FSP-2GOTO280
200 PRINT: PR.NT PRINT
210 PRINT"
                YOU MADE": IFSC-OTHERPRINT" NO MISTARES " GOTO240
226 IFSC-LTHENPRINT" | MISTARE. COTO240
210 PRINTSC; "MISTAKES "
240 PRINT: PRINT: PRINT" YOUR TYPING SPEED IS APPROX"
250 PRINT: X-INT((L/(PT/60)*60)/5)) IFXCLTHENPRINT* 250 PRINT* ";X/"WORDS";
270 PRINT" PER MINUTE. ": GOSUBLESO
280 NEXT)
290 1FSP+.GGTG390
JOD PRINT: PRINT PRINT
                YOU MADE :: IFTS - OTHERPRINT NO MISTAKES. ": GOTO 140
320 IPTS- THENFRINT" 1 MISTAKE . ": GOTO340
330 PHINTTS, "MISTAKES."
340 PRINT. PRINT: PRINT" YOUR TYPING SPEED IS APPROX"
350 PRINT:X=INT:(TL/(TT/60)=60)/5):[PX:(THENPRINT" 1 WORD":(GOT 1
360 PRINT" "/X; "MORDS";
170 PRINT" PER MINUTE.": COSUBIESD
160 REM **NEXT EXCRESS**
190 RESTORE PRINTES: PAINTUS PRINT PRINT
400 PRINT"TYPE:-"
410 IFSC.OTHENPRINT; PRINT"
                                  SPACE FOR NEXT EXERCISE"
420 PRINTIPRINT
                       5 TO SELECT AN EXERCISE"
410 PRINTIPRINTS
                       R TO REPEAT THE EAST EXERCISE" IPRINT
440 GETASIEFASIPPGOTO44C
450 IFAS+" "ANDSC.OTHENS-9-1-GOTO50
460 [PAS="S"GOTO.750
     FAS+"R" , TO SO
480 GOT0440
490 REM **EXERCISES**
500 DATAL, ASOFURE, 4321567, 23, ASOF, ENJASOF, ENJASOF, ENJASOF, ERI
5.0 DATAPOBAJKI, POSAJKI, FOBAJKI, FOSAJKI, FOSAJKI
520 DATAASOF, LKJ ASOF, LKJ ASOF, LKJ ASOF, LKJ
530 DATAPOSA JKL, POSA JKL, POSA JKL, POSA JKL
540 DATASAD DAD LAD ALL, ADD ASK ASS AS
550 DATAASKS ALAS FALL DADS, PLAK LASS LADS ADD
560 DATA2, EDFGHJ, 221, 55, 22, ASDFGFD, LKJHJK ASDFGFD, LKJHJK AEDFGF
570 DATAFGE SHJ AGE, HS FOF SHJ AGE, HS FOF SHJ AGE HS
580 DATAHAG FAG JAG SAG, LAG HAS GAB ASH
590 DATAGLAD SHAG PLAG LASH, SASH HALL MALF HAG
600 DATADED, ED LED RED, JED NED DED, BD LED KED JED WED
5.0 DATAE D ELD ERD, EJD END EAD E,D ELD ERD EJD END BAD
$20 DATAFED LED KEG LEG, ELF BLR SHE HE
530 DATASKED HEED FEED SHED, PLED READ LEAD RELO
540 DATAJ, RTF, . 11, 24, FRF RF ERF, KRF JRF HRF FRF, BF LRF KRF JRF HRF
650 DATAR F RLF RKF, RJF RHF RAF A, P RLF RKF RJF RHF RAY
660 DATARED RAG ARE ARE, FAR JAR BER EAR
670 DATARASH REEL REAL MEAR, HARK MARE HERE JEEP
680 DATARAGED RAKED HEARD LARKS, LARGE EAGER SAFER ELDER
690 CATAFTY TF LTF, KTF 3TF MTF FTF, TF LTF KTF 3TF RTF
700 DATAT F TLF TRF, TUF THE TAF T, F TLF TRF TUF THE TAF
710 DATATAG TAR THE JET.LET PAT HAT AT
720 DATATHAT TALL TALK THEE, HATE LATE JEST LAST
710 DATATELLS THEFT THERE THREE FATAL CATER MALTS LEAST 740 DATA4, JJIK, 5566, 24, KIR AIR SIR DIR, FIR GIR KIR AIR, SIK DIR FIR GIR
750 DATALAK ISK IDK IPK, IGK I K IAK ISK. IDK IFK IGK I N
760 DATASIR FIR FIT JIG, ALD DID 810 15
770 DATAGIFT SIFT HILL FILL, GRID GRIT BAIL FAIL
780 DATASKILL STILL RIGHT TIGHT, DRIFT STIFF SILKS JILTS
790 DATAJUJ AUJ SUJ PUJ, FUJ GUJ JUJ AUJ, SUJ DUJ FUJ GUJ
800 DATAGAJ USJ UDJ UPJ,UGJ U J WAJ USJ,UDJ UFJ UGJ U J
8 0 DATAJSK DUG RUG BLE, DUE HUT RUT FUR
820 DATASURE TURP BURT JUST, RUSH TRUE RULE DULL
830 DATAUTTER WEHER USUAL SUGAR, RORAL TROTE TRUST FRUIT
840 DATAS, DCYJ, 2255, 24, JYJ AYJ SYJ DYJ, FYJ GYJ JYJ AYJ, SYJ DYJ FYJ GYJ
850 DATAYAJ YSJ YDJ YPJ, YGJ Y J YAJ YSJ, YDJ YYJ YGJ Y J
860 DATAYES YET SAY DAY, TRY PRY SLY FLY
870 DATAYEAR YELL YARD GREY, THEY TRAY LADY JURY
880 DATAYEAST BURRY DIARY SADLY, SILKY FIFTY STUDY STYLE
890 DATADOD OD LOD KOD, JOD BOD DOD OD, LOD KOD JOD BOD
900 DATAC D CLD CKD CJD, CHD CAD C D CLD, CKD CJD CHD CAD
910 DATACAD CAR CAT CUT, CUR ACT ICE ICY
920 DATACITY CALL CARE CURE, SCAR DUCK RICK SACK
910 DATAUHEER CIGAR CRATE CRACK, TRUCK TRICK TRACE TRUCE
940 DATA6, EVB, 111, 24, EVF VF LVF RVF, JVF HVF PVF VF, LVF RVF JVF HVF
950 DATAV P VLF VKF VJF, VHF VAF V P VLP, VKF VJF VHF VAF
960 DATAVAT VAS VIS VIA, VIE VET REV DIV
970 DATAVALE VAGE VARY VERY, CAVE HAVE LIVE FIVE
980 DATAVAGUE VALVE VALID VIVID, VERVE CURVE CARVE EVERY
990 DATAFBE BE LBE, KAP JAP HAE FRE, AF LBF KBF JBF NAF
LOCG DATAB F BLP BEF BJF, BHF BAF B F BLF, BEF BJF BHF BAF
.O.O DATABAG BAT BUT BUY, TAB CAB CUB TUB
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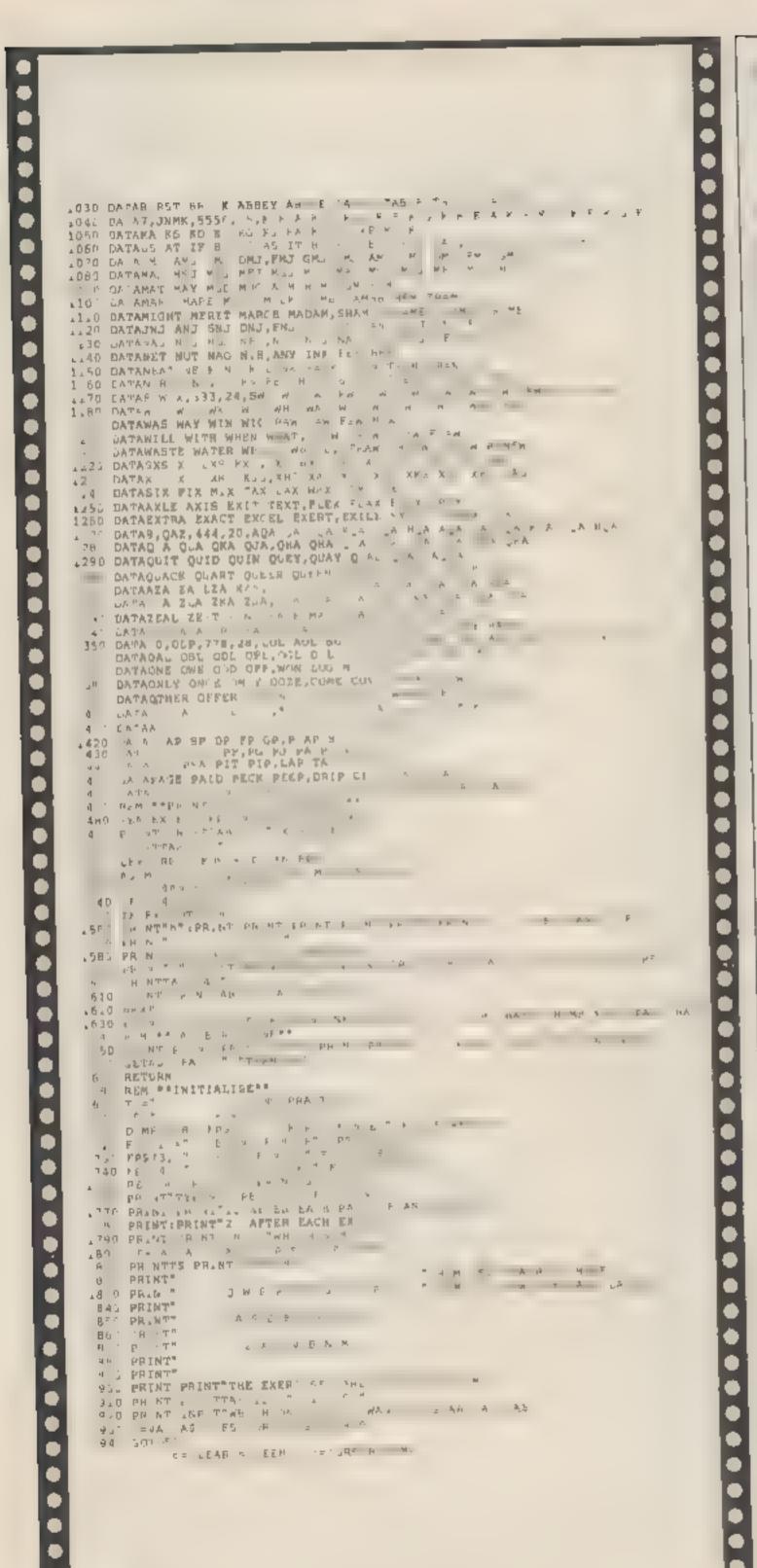
standard form of BASIC and should run with min mum changes on most micros. The only usual feature is the clear screen symbol in ine 1690. The REM (remarks) statements show what each section of the program is doing - they may be omitted. The program runs in under 8k. The graphic representation. of the keyboard in lines 1820-1890 may be omitted if your micro does not have the appropriate graphics characters - the representation is for clarity only and can be dispensed with

Mappy key hammering

Major Variables used in the Program				
T\$ and U\$ FP\$() SP S EX F S F'S N TT TT T	Title Text for finger positions Indicates at which point speed rating is displayed Selected exercise Exercise number Letters covered in this exercise Finger position codes Number of portions in this exercise Scored mistakes this portion Total mistakes this exercise Time started this portion Time tinished this portion Total time taken for this exercise If me etapsed in "Jithles" (seconds x 60) since the computer was switched on if your micro has not got a facility of this nature, you can simulate it roughly by building up a count and equating that with the flumber of seconds that have			
	elapsed			

continued

1020 DATABALL BACK BULK ABLE, STUB STAB GLIB GIBE





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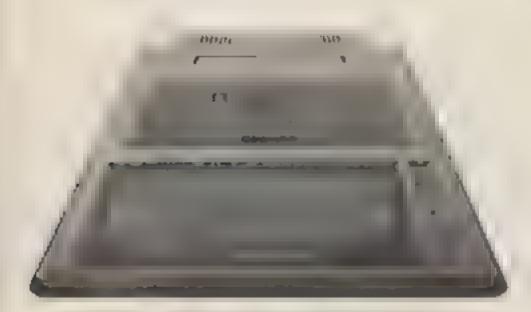
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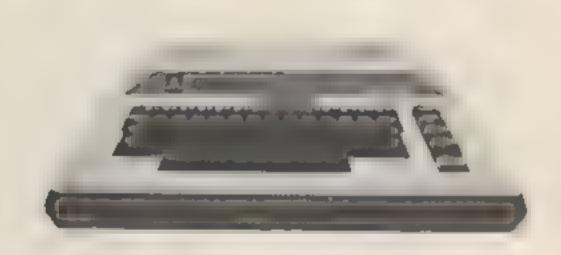
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Terry Hope dreams a Tolkien-like tale and wakes up to find him

J. R. Tolkien lans (believe me. I'm one – which might explain the curiosity of what follows) will have to forgive my arrogance in dozing off the other evening and dreaming I was none other than the master himself.

Everything was a little hazy but I was certainly poised, pen in hand, over a clean sheet of paper. Then, as I walched from somewhere outside myself, I slowly began to write.

I know of a group known as Skaert Retupmoc who live in a country which is (or father was) green and pleasant but just the timest bit dult. Until but (for this is how they measure their time) a lew staey ago, life stretched out monotonously for the Skaert Retupmoc

Interestingly the Skaerf Relupmoc are not numerous compared with all in the land. But it is said (by themselves admittedly) that they are visionaries, seeing ten to twenty staey hance.

In that time, they say nearly all will become Skeerf Retupmoc (or possibly Sresu Retupmoc, for it is only a question of degree), for the retupmoc (an artifact from which the skeerf get their name) will be in the dwellings of nearly all, resting alongside the sertned cisum (another artifact which heatly all the people possess), and the pleasure level of infe will increase thereby

But I digress One day, all was changed for the Skeert Retupmoc when they heard of grants who made many and varied types of retupmoc and lived in countries across the sea. These countries were many leagues away but still close enough for the seven league boots the grants were to carry them easily across the water

It was not long before some grants came and, though they mostly proved benevolent they did have one of two rather unpleasant failings as far as the Retupmoc Skaerl were concerned. Indeed, they were more than a failing, they were the worst possible sins

From one thing, the first giants did indeed produce many diverse and wondrous retupmod but the instruction tablets which accompanied them might as well have been written in a foreign longue for all the skaer!

could understand them. Worse, the giants promised goodles of various kinds, only to break their promises later. Perhaps most evil of all, the giants produced retupmoc only to replace them later with different retupmoc which bore no relation to the first ones.

Quite quickly the Skaerl Retupmoc be came disillusioned It seemed that lew of the giants could be trusted. Thus it was, when rumours of yet another giant's arrival were whispered, together with tales of goodies the like of which had never been seen before. The Skaerl Retupmoc looked very disbelieving

It seemed these new giants were brothers and known collectively (for they were Siemese twins) as Sorb Rentaw

Sorb Rentaw was (or perhaps it should be were) known to be benevolent too, and it seemed that he (or they) planned to send a new-born son named trata to converse with the Skaert Retupmod and even to make many new Skeert Retupmod of those who were still unknowing of the retupmod magic trata was to stay with Sorb Renraw's good friend (or so it was said) Llosregni, and from Llosregni's castle to the north of Nodnoi. Itala would venture forth and speak to the Skaert Retupmod in their thousands

Alas for the Skaeri Retupmoc, it seemed after a period that this too was but a shallow deception. True, Irata did venture forth and conversed with over 6,500 of the people some of whom were already Skaert Retupmoc and many who were not. All of whatever sort, through accepting Irata's token (which came in two sizes and several variations), be came known as Skaert Retupmoc Irata.

But for the most part trate made little impression on the non-skeert and only slightly more on the Skeert which displeased Sorb Renraw a very great deal – indeed, some said he was hacked off an odd phrase the Skeert Relupmoc also used but in a different way

Sorb Renraw began to look suspiciously across the water at Liosregni, for he had a growing feeling that Liosregni had insufficient interest in introducing frata to enough people.

Liosregni protested innocence and it was said offered all manner of explanation, but none was good enough to satisfy Sorb Renraw

Had not Irala aiready proved popular with many many thousands of Sorb Renraw's own countrymen? Was not Irala totally unlike any other with many more lacets to his being than the average Skaert Retupmod would ever know? Did not Irala have beautiful labilets of instruction, which even the most nervous of non-skaert could comprehend?

Perhaps, thought Sorb Renraw Lipsregni was not handling the arrangements as Sorb Renraw would have done, and no sooner had he thought it than he became convinced of the truth of the matter

Soit seemed there was only one thing to be done. He. Sorb Renraw himself no less would cross the water and personally guide and control trata's dastiny. He would carry with him all the goodies that Liosregni seemed to have overlooked he would smile and beam and show and tell, he would open his purse and spend many gold pieces (much more than Liosregni had seemed willing to disburse), and he would bring trata to the masses.

And so Sorb Renraw arrived in person it was a quiet almost secret affair. There was no sounding of brass, but the differences be came apparent almost immediately.

Liostegni, for instance, vanished almost without trace, save for great riches which it was said Sorb Renraw had passed into Lios regni's hands. Quite why these riches were passed none knew, since was not trata the lawful son of Sorb Renraw (and much beloved for he earned great sums for Sorb Renraw in their home country, Perhaps, it was said, the riches were for the introductions which Liostegni had already performed, few though they were in Sorb Renraw's eyes

Whatever the truth of the malter Sorb Renraw moved into Liosregnis castle north of Nodnol, where he planned to live temporarily while an even more splendid abode was readled for him in Notrepia, which was more central of Nodnol, not in the jungles, to the







Horses which actually gallop! From the APX collection of demo programs

himself testing Atari's program exchange software.

north, and thus true to Sorb Renraw's image

And trata? What became of him? Did he become known to many who were not as yet skaer? Was his carefully designed raiment his beautifully honed manners, his simplicity of speech and usage, his frandly approach of great and tasting appeal to the non-skaer?

Ah my friends, this is where we must wait to see, for this is a fable which is not yet finished

And then I woke up

Now you appreciate that all of the above was the merest frothy diversion, dreamt during a desultory doze with no connection at all with Ateri home computers. And yet there are I suppose certain parallels Perhaps the most striking is what you and I are going to see over the months to come as Atari gets into its stride.

And to that extent I've been having a very close look at something which is currently unique to Atari, the Alan Program Exchange which is known as APX for short

Actually the name's a bit misleading because at first sight it suggests there's some sort of swap element involved. You know the sort of thing, you send a good program in and you get a bad one back.

Not so in the case of APX, the concept and name of which is presumably derived from the PX of American Forces, bases. We can the same thing over here, from which you'll gather the PX is a sort of low-cost shop, run for the benefit of those qualified to take advantage of it. And that slexacily how the Atar-Program Exchange works too.

How APX works

To explain the idea fully, let me quote from the Atan APX Catalogue

"Atan created the APX to distribute user written software for Atan home computers. The goal is to increase the usefulness of Atan computers by building a ilbrary of high-quality, imaginative software appealing to users of various ages and with differing needs and interests."

Atan offers this software quickly and inex-

pensively by using simple packaging, relying off user instructions written by the software author to APX standards, and foregoing follow-up support. In many cases the program author provides the follow-up support, the (catalogue) descriptions indicate when an author supports a program. The descriptions include both a program s strengths and its limitations, so you know what to expect

Now there sinc doubt at all that Atan's arrival in the UK as a distributor of their own products in their own right is a very important event indeed for anyone who sithinking of buying a computer, or changing their existing model for another

The one remark that's often made about this or that micro is "but there doesn't seem to be much software for it." In many cases this is true and all too often it stays true for an inex cusably long time. It's also stupid because it's Catch 22 in arnate.

Software sells hardware

One axiom in the computer world—and it was never more true in the micro world—si "software sells hardware". There'll always be those hardy souts who buy when a machine first appears, but there'll be more who wait until it seems that there's an adequate amount of software to support it.

For some reason, the APX programs seemed never to be available until Atar themselves arrived to market their own product in the UK Don't ask me why – I don't understand it

Thus there were only the fully-packaged relatively expensive. Alan-writen programs available. They were (and are) good very good indeed, but they weren't enough.

Programs galoref

Now the full range of APX programs is about to be available and that's going to make a dramatic difference (True, some APX programs were available before from independent "grey" importers but at what seemed like very inflated prices.)

But how good are the APX programs?

We ve seen so-called "program libraries" be fore, and the materia, in them has always been of how shall put it, not hugely profes sional quality.

Well, I ve had the opportunity over the last lew weeks of testing examining, using and playing with a large number of the APX programs, and I have to say right now that by and large, I've been very impressed

There's no way I can review everything in the APX catalogue here (there are over 100 programs listed and described in the Spring 1982 edition), but let me mention a few

Six different categories

They come under six categories. "Persona Finance and Record Keeping", "Business and Professional Applications" "Personal Interest and Development" "Education" "Entertainment" and "System Software

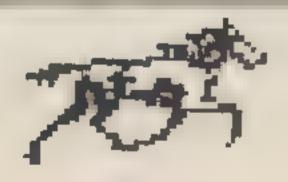
For purely personal reasons, the program I like the most is in the "System Software calegory it's a screen-to-printer dump utility."

The Centronica 739 printer (supplied by Atari s previous agents Ingersoil in place of

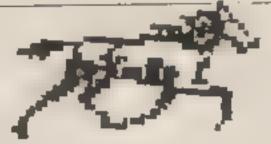


An orthographic equatorial map produced from the APX Mapware program, using the APX Screen Dump









the Atan 825 printer which seems to have mysteriously disappeared from Atan's catalogue for the moment), is capable of high-resolution graphics printing

Since the Atari computer is also capable of the same thing it's marvellous to have a utility that allows anything on the screen to be dumped to the printer by simply pressing right-per The quality of the end result is taily evident from the reproductions with this

I boots itself into memory and stays there undiscurbed until you power down, so it can be thought of as an ever present utility to be activated whenever needed

it's only available on disk and needs 24K of memory to run but anyone with a printer is writingly certain to have a disk unit and enough memory. Price in the UK should be around £10,00 which gives you a good idea of the value youliget from APX.

Entertainment's not forgotten

In the "Entertainment" category let me menlion two programs. Chris Crawlord's eye
popping. "Eastern Front" and William
Graham's scarey "747 Landing Simulator".
"Eastern Front" is a war game which re
creates the German attack on Pussia in 1941.
The graphics are mind-blowing. there really
a no other word for it. If you want to see the
extraordinary effects Atar. (and that a your
Atari. If you have one) can produce, see
Eastern Front". It is available on casselle of
disk for about £22.50, and runs in 16K for the
former or 32K for the latter.

But Grahams "747 Landing Simulator puls you fair and square in the pilot size of a jumbo and invites you to see what the pilot sees while you (because you're the pilot) bring the plane in it's immensely complicated totally territying and convinced me after 1 d written off God knows how many a ricreft that the RAF was right when they decided that flying wasn't for me. It's available

HI-FI COLOUR 10 - UIDEO HNIT - HOLIDAY -

CHETRUCT TONS

Based on information provided, the most logical choice is HOLIDAY

The result of a full family decision – we'll go on holiday and no arguments!

on cassette or disk, will cost approximately £14,00, and you'll need 24K in either version to take to the skies

Withdraw this program!

White on games. I'd like to bash out with a brickbat aimed fair and square at Alan Newman's "Domination". The APX catalogue bilts it as "a game where greed cunning and ruthlessness can work to your advantage." The catalogue also says it's "recommended for ages 12 and up." Leaving aside the question of whether it's a good thing to encourage 12-year-olds to be greedy cunning and ruth tess the heart of the game involves competing for world power via economic means and (my italics) nuclear or conventional warfare.

I'm no wild-eyed pacifist, but norther am terribly keen on the next generation growing up to believe greed, curning, ruthlessness, and nuclear weapons are the answer to the world's problems. It's all made worse by the thin disguises given to the names of the countries which figure in the game.

n my view Atan should withdraw this game from the APX catalogue. I have few complaints about its programming but I sure as hely feet strongly about the appalling in sensitivity and bad taste demonstrated in its presentation and description. The fact that it earned first prize in ast autumn's Atan-spon sored APX compet ion and that he write-up on another program ("L'etterman") says "has it ever bothered you that a game as lun a Hangman has a violent underlying premise?"

Make a map of anywhere!

Now let's move on to two programs in the Education" section. "Mapware" from Harry Koons and Art Prag. and the beautiful "My First Alphabet" from Fernando Herrera.

Messrs Koons and Prag deserve an accorace supreme for a masterly bit of programming and efforts which must have taken them close to the edge of insanity.

Mapware" comes on two disks (so or course you need a disk drive to use it) and will draw a map of any part of the world in any of four standard mapping projections – cylin drical, azimutha, equitistant, orthographic equational of perspective

All you need to input is the left tude and iongitude of the place you're interested in and prestof the map is drawn in high-resolution

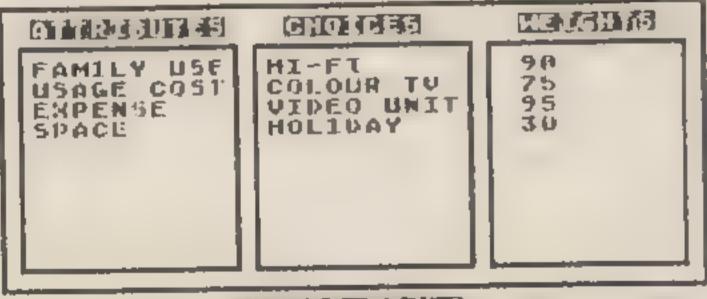
1 s all done with a diever program and 2 000 - yes 2 000 - co-ordinales in data form on the second disk. The thought of entering that lot makes me blench. You'll need a disk drive to run it of course, and a full 40K of RAM. I recommend it very highly especially for teachers, and at about £17 00 for both disks, it's very very good value for money.

The \$25,000 prizewinner

Which brings me to Fernando Herrera's "My First Aiphabet". Every quarter. Alan give a prize for the best program submitted (this is in addition to the royallies program authors get from sales.

Then every year Alan now give a grand prize of \$25,000 for the best program of all My First Alphabet" look it tast year and one viewing makes the reason why very clear

Amazing y Fernando Herrera first bough



INSTRUCTIONS-

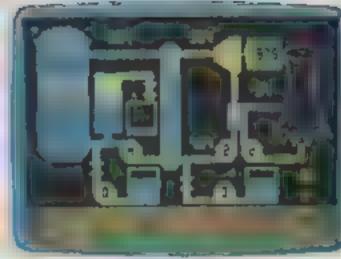
Now compare the relative weights of each choice for each attribute. Higher numbers mean more desirable.

press BANAN to proceed.

The APX Decision maker can help avoid family arguments! This shows the process half completed.



Music Composer



Self-still.



Cipiph it



Intro to BASIC !



Star Raiders



European Countries



Missile Command



5.7 m. hon reasons why the Atari Home Computer is something to see. The display screen used with our computers is composed of 192 horizontal lines, each containing 320 dots. Delivering colour and luminosity instructions to each dot for a second requires 3.7 million cycles..., a lot of work for the normal 6002 processor.

That's why the Atam computer has equipped its 6502 with its own electronic assistant, it's called ANTIC, and it handles all the display work, leaving the 6502 free to handle the rest. What this means to you is uncompromisingly spectacular display capabilities without loss of computer power needed to carry out the demands of your program

That's a quality you just don't find in ordinary home computers. And it's one of the reasons some computer experts say that Atan computers are so far ahead of their time

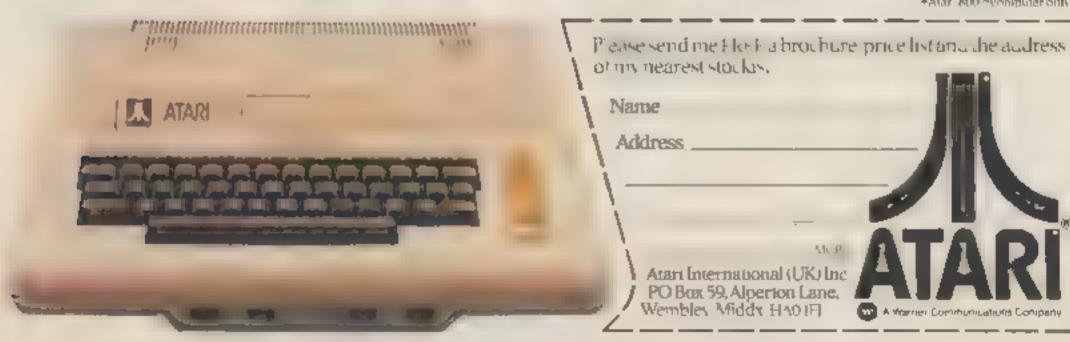
There's more, which is what youd expect for Alam Language. The Atam Home Computer uses several programming languages to give the user maximum control of its extraordinary capabilities, PH.OT. Microsoft BASIC of diAtam BASIC are totaler stood and spoken by the Atari computer You'll dso find our Assembler Editors, rigidge and spensable for machine lang rage programming.

Sound. An Attari computer has four sound generators, or voices, activated by a separate microchip. This leaves the principal microprocessor chips free to perform other tasks. And you can take full advantage of this cap. bility which is designed for easy programming

Change, Atari Home Computers have been designed to make change and expansion easy. The Atari computer has a modular operating system that can be easily replaced as new technology develops. If you need it, memory expansion requires no more than inserting additional RAM modules." And the Atari ROM cartridge system also makes it easy. to change languages. In short, your Atari computer won't become obsolete by future developments. .because it already incorporates the future

Sharing. To learn more about the amazing capabinues of Atari Home Computers, either visit your local dealer or fill in the compon below

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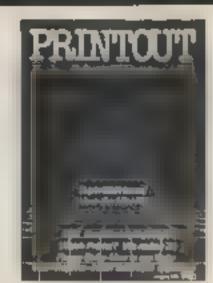
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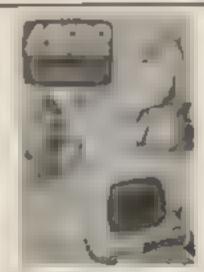
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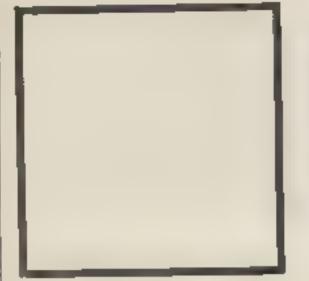


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HUNN



Having looked at the 'black boxes' that make up the internals of a microcomputer, this month **Chris Preston** shrinks to microscopic size and explores the inside of a microprocessor.

In the last article in the current series, we will be actually delving inside the processor itself. This may seem a little extreme to readers who perhaps shudder at the thought of even peeking inside the lid of their computer, but it isn't as bad as all that. Obviously, we do not expect our readers to be designing their own processor chips: not even *MicroComputer Printout* could teach that in a single article! However, we do hope to remove some of the mystique surrounding that uit mate black box, the Central Processing Unit

In last month's article, we looked at a simple block diagram of a computer, and we saw a box labelled "Processor" with three buses coming out of it the Data Bus, the Address Bus and the Control Bus. We know that when the processor is executing a program it is continually letching instructions and data from memory, and maybe writing data back again. So what happens inside the processor, and how does it interpret its instructions?

Fig. 1 shows a block diagram of an imaginary processor. It is quite a simple unit, having only an accumulator, a stack pointer and program counter. A practical processor would possibly have several accumulators and some index registers.

Arithmetic Logic Unit

The work horse in the processor is of course the arithmetic and logic unit, usually called the ALU for short. This is where all the actual processing is done addition, subtraction, shifting and so on. The ALU also contains a number of flags, (a flag is nothing more than a single bit which signifies the status of some operation) zero, significantly etc. which provide extra information on the results of calculations. In our life processor all calculations are carried out either in memory or in the accumulator.

The address bus is controlled by the Next Address Register, NAR. This taxes its value from either the Program Counter (PC), Stack Pointer (SP) or from the data bus. We will see exactly how it works a little later on

The program is actually decoded and executed by the Instruction Decoder (ID), which fetches instructions from the program memory, decodes them and passes the necessary commands to the Control Unit (CU). This decoding is done under control of a microprogram. The instruction decoder is in effect a computer within a computer with its own program. The main difference between the microprogram and the normal computer program is that whereas a program is sequential, each operation (A=15°B) having to wait until the previous operation is finished, a microprogram is paralle. For exam-

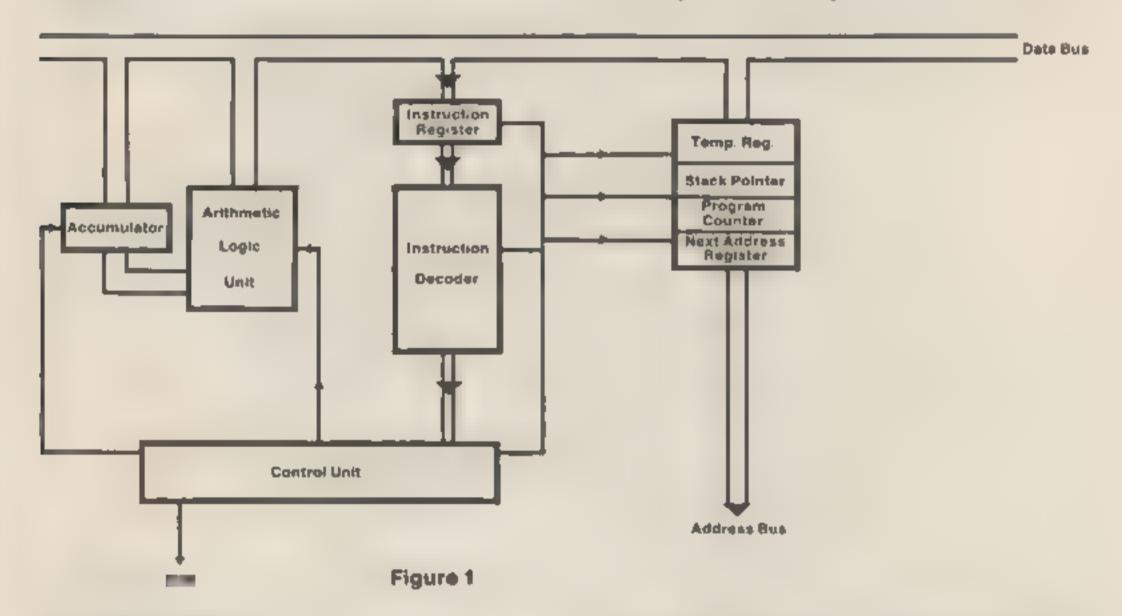
MODIFIES

PART 3

pie, many instructions in a microcomputer occupy several bytes so the instruction decoder can increment the program counter to fetch the next part of the instruction while at the same time the control unit is setting up the ALU to execute the instruction.

#15, which loads the number 15 into the accumulator

Having fetched and decoded the opcode, the instruction decoder finds that it needs a byte of data, so it executes a memory read cycle, moving the program counter to the next address register, then reading the value. 15, which is loaded



Instruction decoder

Before we look at some simple instructions, let us break down the process of executing an instruction. The first part is the instruction fetch, where the processor reads the opcode from memory and decides what to do with it. To do this, the instruction decoder moves the contents of the program counter into the next address register and sets the R/W line high, to tel memory that it wishes to read it. (If you do not understand this go back to last month is article). It automatically increments the program counter to point to the next memory location.

At the same time. I sets up the instruction register to read the opcode. When this arrives, it is held in the instruction register while it is being executed. This is called 'fatching', and is necessary because the contents of the data bus will change during execution.

The instruction decoder then looks at the opcode and decides what to do next. The instruction may be a single byte instruction such as CLC, which clears the carry flag, in which case the instruction can be executed immediately, without having to read any more data from memory. Usually though the instruction needs some data, in which case the program counter is moved to the next address register (and instruction automatically again) and the byte or bytes of data read. As an example of a two byte instruction we have LDA.

into the accumulator. Again, the control unit performs several operations in parallel, setting up the address from the program counter and telling the accumulator to read the data bus.

Temporary register

In a program, the LDA #15 which sets a value in the accumulator, might well be followed by a STA 2000, which stores the contents of the accumulator in memory location 2000. How is this executed? After the instruction has been decoded, the decoder knows that it has to fetch an address which occupies two bytes in a typical 8-bit micro so it now has to execute two memory read cycles, one to fetch each byte. As each byte of this address is read from memory, it is stored in the temporary register. The next part of the instruction moves the contents of the temporary register, 2000, into the next address register and issues a write command, teiling the accumulator to put its contents onto the data bus. This data is then accepted by the memory.

It is about time the ALU did some of the work round here so let us look at ADD #5. This instruction adds 5 to the contents of the accumulator. After the decoder has decoded the opcode, it again passes the contents of the program counter to the next address register, incrementing the program counter at the same time, and reads the operand, 5. This data



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HOW IT WORKS

is now loaded into the ALU, and the control unit teils the ALU to add it to the accumulator, and pass the results back to the accumulator.

The fact that the contents of the program counter are incremented automatically whenever its contents are read seems to be a good thing but can you think of any occasions when this would waste time? When the processor executes a ump instruction or a call to a subrouting, or in fact any instruction which causes a break in the normal program flow. This is because when the processor has finished decoding the instruction, and read all the operands, the program counter points to the next instruction after the jump instruction, but then the contents of the program counter are over written, which causes the jump to take place. However, if you look at any program, the number of branch type instructions is very small, so the cost here is small compared with the sayings involved in all the non-branch instructions.

Machine cycles

of the data and address lines as each machine cycle is exellected. We are using 6502 mnemonics, which will be the most familiar to our readers. All values are in hexadecimal

			· ·	
1	Address	Date	Assembly code	Machine code
	1000	A9 15	LDA #15	MR OPC
	1002	AD	STA 2000	MR OPC
	1003	50		MR
	2000 1005	15 18	CLC	MR OPC
	1006	6D 00	ADC 1500	MR OPC
	1008	15 4C	• JMP3000	MR OPC
	100A	-00	0 0000	MH
	100B 3000	30		MR

MR - Memory read MW - Memory write OPC - Opcode feich

So we see that even though our model was quite simple we can use it to show most of the features found in the current range of 8-bit microprocessors, with the exception of indexed addressing modes. See if you can work out how a JSR and RTS combination would be executed. If you want to, you can add some index registers in between the temporary register and the stack pointer. In fact, most of the simplifications we have used in the model are 'practical' ones, rather than theoretica, that is we have left out multiplexers (a buzz word meaning switches) to solate the various parts of the processor from each other and the outside world, and drivers, which allow the various internal registers to push their signals out to the rest of the computer without tiring themselves too much. These are not important when it comes to understanding how the thing works though, so why not leave them out.

This brings us to the end of our short series on computer hardware and architecture. If there are any other areas of computers on which you would like to see an article, why not out pen to paper and let us know about it?

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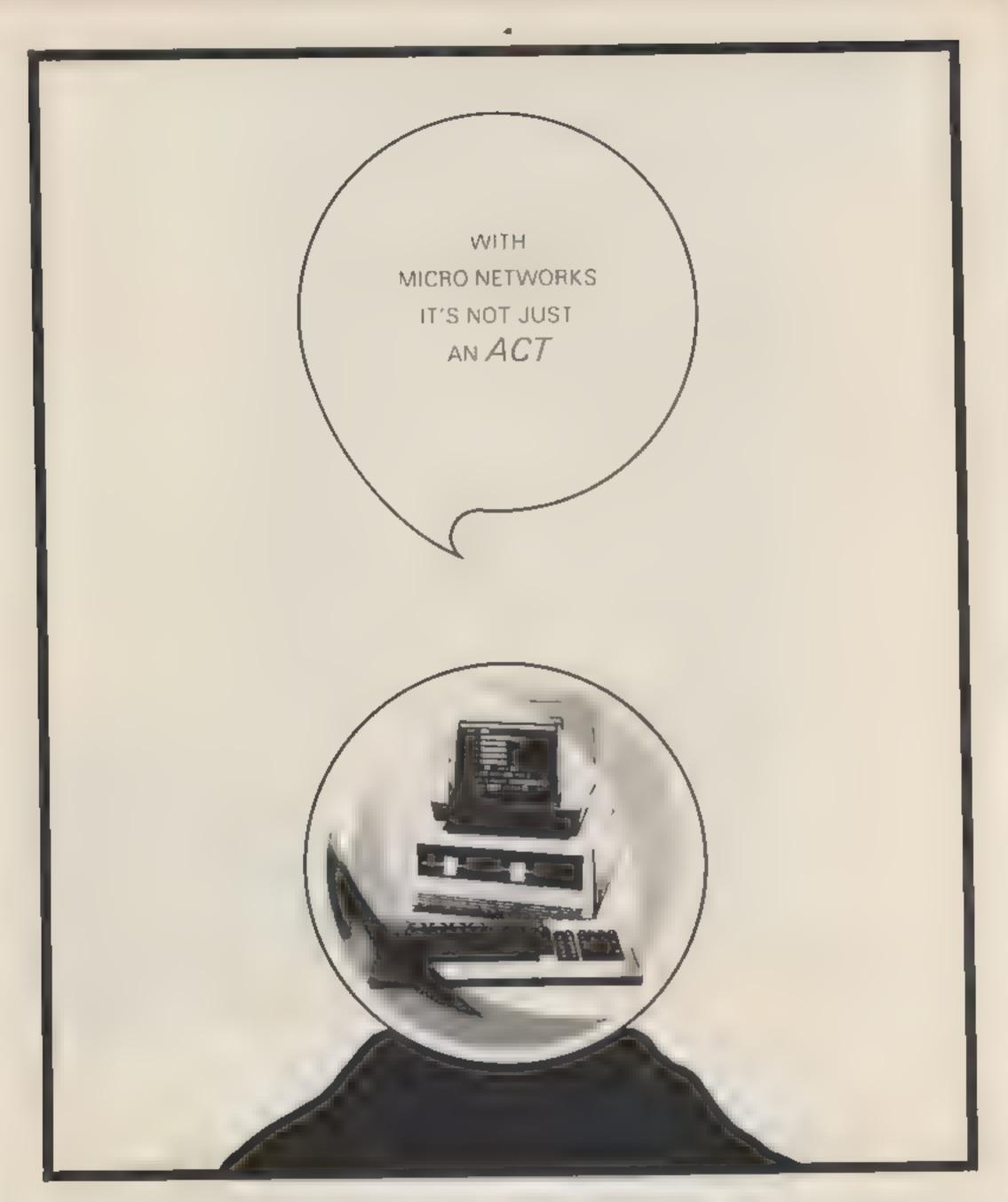
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FINAMULAIL MODELLING What is Financial Modelling and who uses it? Is the 'Electronic Spreadsheet' a new idea - or has it been borrowed from mainframe computing? Which of the VisiCalc look-alikes is easiest to use? John Gowans looks at the history and likely future of this popular application.

State-of-the-Art Report:

"Be that bill our sign of parting man or fiend!"
I shneked, upstarting -

"Get thee back into the tempest and the Night's Plutonian shore

Leave no VAT forms as a token of that he they south as spoken!

Leave my toneliness unbroken! and quit the bust above my door!

Take they claws from out my wallet, and take thy form from off my door

Quoth the taxman, "Nevermore."

(With suitable apologies to a certain Mr F A Poel and a reassurance to the ed for that the copyright has run out – I hope.)

As the end of the tax year rolls inevitably round each spring, the average businessman's fancy lightly turns to thoughts of how the hell he is going to pay the bir — and of how to work out if tax changes hithe 8udget are going to have any effects on his business for the next 12 months. Those thoughts often run along E.A. Poe thes, and I have always thought that if Poe was, say an estate agent, today he would have written just the lines produced above. He would also have been one of the first in the for a micro and some financial modelling software, if he could get his mind off mysterious black birds for a white.

For financial modelling is a wonderful computer tool for calculating the effects of tax changes price rises, or falls in sales on a business and producing the five year plan to make the best of things. Come to think of it, Stalin could have done with a financial model or too. If the grain harvest falls 40% below target, how big does the purge have to be?

Simulations

A. this historical perspective stuff is an indirect - very indirect - way of saying that linencial modelling, or computer modelling in general has not sprung fully formed from the lains of the microcomputer. One of the I rat things people did with computers was to set up models of various systems, shove various bits of data into the model, and see what came out. These models were no 1 72nd scale Airlix type either, but simule hors of national economies or multinational corporations an example today is the Treasary's model of the British economy, into which the mandarins plug smaller and small let money supply figures and extract erroneous results about unemployment levers. And just to show that this kind of modelling is not limited to shifting cash and economic faclors (but mainly cash) around inside a compuler, a certain close lemare friend of mine. at a certain south-coast University compieted her Matha degree by working out a computer model of the local airport, predict ing passenger numbers and flow here the värying parameters used were things like opening a new runway or speeding up customs clearance and baggage collection. It must have worked too, since she got a 2.1.

This kind of thing was really only a sideline.

though. The main beneficiaries of computer power in financial planning were the big companies with complicated structures of operating divisions, each with its own financial peculiantes, where making the wrong strategic business decision could lose miltions. Trying out strategies on a model became a vital aid to decision-making, and computer bureaux sprang up with the software to let the companies suck it and see. And everything chugged on very happily, with the big mainframes churning out the business information and the big firms busily making the right decisions and raking in the readies. Then came the earth-shaking advent of you must have guessed - the microcomputer

"Trying out different assumptions is what all this is about — and if the results all look bad you can act now to prevent trouble later, by cutting prices or more likely sacking people."



And the microcompuler in turn started one of the most remarkable success stories the computer business has ever seen

Meanwhile – if Edgar Rice Burroughs (no relation to the Motor-City maintramer) can get away with cith hangers so can I lifet's took in a bit more detail at what financial planning and modelling are all about

Related factors

This kind of financial software has a lot in common with the relational database sys-

tems discussed earlier in this series, in any business there are many factors that need to be taken into consideration, and these are interconnected or related in various ways. For instance, an increase in VAT means an increase in the sale price of a product, which from previous experience means that sales volumes, fall dramatically, which in turn means that cash income fails, stock levels rise, the overdraft grows, profits go through the floor, and so on and so on

Now in the computer model you can set up all the variable factors complete with all the relationships between them — for instance, cash input = sale price x number sold. Once all the current figures have been entered, you can actually start getting useful results. One typical application would be to project a whole year's business figures making assumptions about things like how much pay settlements will be and how much inflation will rise. You can then say that with these assumptions, this is what the result will be at the end of the year.

Trying out different assumptions is what all this is about – and if the results all took bad you can act now to prevent trouble later by cutting pieces or more likely sacking people. Whenever some smart-suited shys ter ters you that Cosmic Chip Corp, expects to do \$1,000bm in sales by year-end 1983, it is more than likely that he is using a financial modeling system with some very odd assumptions of his own built in

This is the heart of the subject but of course there are tria you can add it is sometimes nice to be able to take information from one model and use if to build up another or to take the model data and word process it before printing so that Cosmio Chip's auditors get a flashy presentation. And nicest of all you can use the data in the model to produce prefty coloured pie charts, histograms, sales graphs, and other audity-visual's de lodder.

All this is meat and drink to the big firms and the bureaux with their big machines and has provided the bureaux with a large proportion of their income for many years. Then LO! there was VisiCalc, and the picture started to change.

The editor of this organ – no organ himself is am pleased to report – tells me that Microcomputer Printout readers know all about VisiCale. But for those tew people who have been lotus-eating in the South Seas or deflained during Her Majesty's pleasure for the past few years, let's see how the Visible Calculator came about

Electronic sheet

The story starts in 1979, with two talented programmers called Dan Bricklin and Bob Frankston working for a Massachusetts out in called Software Arts. They saw the expensive financial planning and modelling packages running on mainframes and minis and realised that at least part of these systems could be implemented on a cheap microcomputer. And what they came up with was VisiCalc, an Apple-based, no-fr is file.

State-of-the-Art Report

• nancial modeller called variously a window into memory, an electronic spreadsheet, or even an 'electronic sheet', which I find a rather disturbing concept. What it offered the user was an easy-to-use calculating program, in which a table measuring 63 columns by 254 rows could be filled with alphabetic or numeric entries. Each of these entries could be related mathematically of otherwise to the other and changing one element changed every other element related to the changed one.

The rest, as they say, is history. But bearing in mind what happened, perhaps the most remarkable thing is that Apple itself turned down the chance to market the product, and Software Arts went to Personal Software of Zanker Road, San Jose instead Now Personal Software has sold more than 200,000 copies of VisiCale worldwide, and those in the know reckon that the program has been responsible for the majority of new Apple II sales. People wanted the program and were forced to buy an Apple II to run it on since it was written in 6502 mechine code in Apple format. Poor old Apple — If could have made even more money.

This meteoric success naturally led to look-alike products hitting the market, since the most obvious thing VisiCaic couldn't do was run on a variety of machines – particularly CP/M machines. Interestingly as VisiCaic is not exclusively a financial modeller, the followers fell into two categories, one was composed of pure VisiClones, mostly for CP/M and the other was made up of mictocomputer implementations of the complex linancial planning systems running on the maintraines. We'll be looking at both types in more detail later on, since there are more and more of them appearing in the UK every month.

But meanwhile (again), what were those big-machine bureaux up to? After all, they were seeing prospective customers of theirs being seduced by the mouth-watering idea of financial modelling on the desktop. What could they do about it?

The response of Comshare, which claims to be the market leader in both software packages and bureau services for this application, was the simple and classic 'if you can't beat 'em etc.' Until recently the cheapest Comshare financial modelling package gost around £50 000 and needed a maintrame to run on: but now the push downmarket is on

Bureau service

Nigel Pendse, marketing manager for Comshare's financial planning products in the UK is by no means embarrassed by being dragged down into the micro arena that other big-machine firms find demeaning. He feels that the expanding market is big enough for everybody. The way we see the market developing is into various areas there are three so far "he says. "There is the stand-alone microcomputer system, the inhouse mainframe or mini system, and the bureau service. It's true that the micro packages like VisiCaic are taking the tow end of

the market, and that the top-end micros are pushing the bottom end of the mini/main-frame business. But the mainframe systems have moved up-market into a different class of problem, and our bureau services haven't suffered at all."

Pendse feels that it is important for Comshare to get into all three areas, and points out the company's moves to do just this From the mainframe-based Wizard package the next step was MicroWizard, a cut-down version for CP/M machines. Then at the beginning of the year came Fastpian, developed in the UK, which is outwardly very similar to MicroWizard. "But Fastplan doesn't upgrade to the mainframe product, while MicroWizard builds up," says Pendse

"In larger businesses, it is often useful to be able to 'consolidate' data from different models; that is, to take information from different models and build it into one big model."



After this, Comshare was stuck. Below Fastplan was the VisiCalc preserve, and the company just didn't have the expenence to compete there But there is always an answer for big companies in this position; buy one of the minnows

Comshare bought out Advanced Management Strategies of Atlanta, Georgia which already had a distribution network in the US for its Target VisiClone package. According to Pendse, his company did not think much of Target and worked with the

new acquisition to produce the successor. The result is Plannercald which will be available in the UK soon. Price will be well under \$100 "It is cheaper than VisiCaid, and obviously we are going to say it's better " says Pendse. The original Target is still on sale from Comput-a-crop in the UK and Jenny Wilson's firm will also be selling Plannercald Both are purety stand-alone CP/M packages.

But the original Target will set you back around £140 – something like twice the expected price of Plannercaic True, Target does have a few features that VisiCalc doesn't like a command language that enables the user to enter relationships between items in the model in a simple and Englishike' way But Target's models can only have a maximum of 1,000 elements, compared with VisiCalc's 16,000-odd, and each element can only have 11 digits compared with

Report generator

The main advantage Target has over the leader is that it includes a report generator section. Like the report generators in database management programs this lets the user print out the information in the model in any way he likes using whichever relationships and bits of information he needs to help with the business decision The printing format can be altered to suit the data being printed as well but Target does not support any graphics output from its models. Apart from this report generator and all the mainkame packages have similar or better ones - Target is very much in the VisiCione category. As to the next of the CP. M look-alikes, SuperCalc from Sorcim Sys tems of Santa Clara in California, as even its (trademarked) name indicates

SuperCalc is probably closer to the VisiCald concept than any of the other competitors on the market. Most of these, like Target force the user to produce a model on paper first and then go through a series of menu choices to build up the model on the computer. And then all the data has to be added as well . But SuperCalcilets you put the data straight into the model's grid displayed on the screen, just like VisiCalc, and even the commands the user gives the system are the same, with the familiar / followed by a letter chosen from most of the aiphabet. SuperCald's grid size is 63 columns by 254 rows, once again exactly the same as VisiCalc 8

So what are the differences? Laurie Bright of LSI Computers, one of the dealers offening the package, singles but extra user friendliness. "A Help function is provided, so that typing in "7 at any stage during work puts advice about that stage on the screen," he says. Hitting 'escape after reading the advice puts you back into the model exactly where you were

Another new and useful feature enables the user to protect certain fields against accidental change, and having recently tried SuperCaic, I can testify that this stopped me

State-of-the-Art Report:

making embarrassing mistakes on various occasions

Help function

Bright's company is also known for selling WordStar and other products from MicroPronternational, so it seemed reasonable to ask him whether he had taken a look at any other financial modellers for CP/M particuiarly MicroPro's own, inevitable called CaicStar, "We've looked at a couple of them "he says, "and I'm told that CalcStar is very like SuperCatc but very much slower. It seems to be about five times slower in fact." So despite LSI's success in seiling WordStar for its own machines, particularly the new and cheap M-Three, it will only be offering SuperCaic as its VisiClone. The price is £190, and after using it from scratch - starting without the manual, against all the advice I give to other people - it seems worth the extra cash. As well as the Help function. another borus is that SuperCarc lets the user produce much better-looking output with long headings and some neat print formatting facilities.

Sorc m Systems, inventors (or at least they invented the new bits) of the package, has a good chance of having the CP/M equivalent of VisiCalc on their hands. For Adam Osborne, whom God preserve of Hayward CA struck a deal with Sorcim that gave Osborne rights to give away a copy of SuperCalc with every Osborne 1 computer sold. Now this is a heat deal. The Osborne sells well – \$1 m of business in the JK in the first six weeks ain't bad — because of the free software he throws in. And every Osborne sale means another copy of SuperCalc going out and bigger. Financial dividends for Sorcim through their stake in Osborne's him.

As for CalcStar Itself, perhaps LSI gave it loo bad a press. It has all the leatures you would expect of a typical clone, but has the added advantage that CarcStar files, the models that is, can be interfaced with wordStar. So before printing out the model, complete with optimistic assumptions, to show the bank manager you can use it as a WordStar document file and edit it to look the with all the boiding and underlining needed to satisfy your aesthetic sense. And naturally, the CalcStar files also fit in with MicroPro's other * Star products (that's an in-joke for CP/M lans), including DataStar and infoStar Oh, by the way, CaloStar will Gosf you around £150

Statistical Analysis

The same approach of letting the user wordprocess his models has been adopted by Vector Graphic, which has yet another CP/M product called Execupian for its range of Vector systems. Following the launch of Execupian 1 Vector's UK distributor Almarc Data Systems is now offering Execupian 2 at around £150

This product is something of a bridge between the simple electronic spreadsheets and the mainframe financial package emulators. Besides the spreadsheet calcula-

tion stuff you would expect—and Execuplan's model size is limited only by the amount of memory space on your machine, in both dimensions – many other useful features are facked on. The package will do statistical analysis of the model data, performing arcane functions like curve fitting, exponential smoothing, the wonderfully-named Box-Jenkins, stepwise regression, and other things that statisticians love and I can't understand like Target it has a command language and a report generator. But the important new features are the handling of data is different models.

In larger businesses, it is often useful to be able to 'consolidate data from different models, that is, to take information from different

"...some micro
modelling packages
are pushing
up-market, including
a lot of the features
normally associated
with timesharing
bureaux."



models and build the different bits of information into one big model, changing the calculations as necessary. Alternatively, and easier for the package's programmer, the modelling software can simply allow data from different models to be merged and printed together as one big model, but without using the merged data for new calculations.

Vector's Execupian gives you the second of these facilities as standard, and the first more complex one as an option.

Also provided is a way of producing files of standard data, like the Government's inflation forecasts or the company's pay settle-

ments for the previous year, and merge these nto any model or models on the system. Then again, Execuplan lets the user write if the program routines for the model to handle particularly complex relationships between elements, as sometimes the standard relationships provided are just not enough.

I first asked Almarc software support man Paul Chambers about Execuplen 1, and he somewhat stiffly reminded me that "we've now moved on to 2" He described the product as "keyed to other Vector software," particularly the highly-rated Memortie III word processor But despite Appie's experience with VisiCalc it seems that it is not Execuplan that sells Vector Graphic machines, "It seems as though everyone buys Memorite for their machine, and maybe one out of every three buys Execupian as wei."

Automorph Press

Comshare's Pendse echoes this view saying that "we see everybody with a micro on the desk doing other jobs, and buying financial modelling software as an additional tool." He also feels that the buying of a micro just because of the financial modelling program available on it is not as common as people believe. "Customers fend to realise they need more computing power if they buy a micro just for modelling," he says. "They still have a micro, but know that a maintrame modeller is needed for the big jobs."

Perhaps Pendse is biased because he works for a company selling mainframe modeling packages and services. But the outline applications he gives for the three market areas seem reasonable anough. "At the very low end, you're dealing with perhaps 1,000 numbers in a mode, that is very much two-dimensional [a apreadsheet in other words]. The middle area is sort of two-and-a-ha! dimensional, with maybe 5,000 numbers or so [modeliers with consolidation of data from different models]. And on mainframes you can be dealing with maybe 1,00,000,000 numbers in N dimensions with relationships between the elements in each dimension."

A lypical example of this last big one is a company with three structures, the pecking order of the company divisions, the product structure, and the geographic structure Each of these would be a different dimension of the model and elements of each would relate to the others. A big job for the Apple 1

But some micro modelling packages are pushing up-market, including a lot of the features normally associated with timesharing bureaux. One of these is Mars, from Sapphire Systems of Benkiest in Essex, and pretty impressive it is too

Mars, the Management Accounts and Report System – damn clever these acronyms – is one of those menu-driven packages we mentioned earlier, where the user has to step through a set of mult pie-choice screens to set up the structure of the model before entering data. Compared with VisiCaic and SuperCalc, which put you straight into the spreadsheet, Mars is slow to get started. But Sapphire. Systems claim that this actually is

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State-of-the-Art Report

makes the system easier for an unskilled. operator to use properly, a though you don't often see difficulty of operation being a technic a or licism of VisiCarc

Anyway once the moule is set up the latn at on parts at it model are enlered. Malagives you some heat commands apart are the usua milihematica and injud lines but his drawback is that helse extra commands. have obe indeed in the another tisk in volving saving the main program and then repading ti

Consolidation

But again on your y operational principles And H Harry Minerary are talk a of of villa aprily to kimp the specially ax (1) at a Me has a in the when the trip compa c my if the may you wrist grayable from the munt. Apart for the import general and , has by I , we name there we ge n a y ar ye Que that the coom to list them here. But the consendation of models rillatis, he merging of multi-dimensional mod omprehensive and worth mentioning. might wonder why with all this inforrr for man pulating stuff. Mars has no facties for producing any graphics output for y double file of a n

I (-- k---, e costing £400 you would have thought half the to the transposition

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Currency conversion

Personal Soltware came up with a super-

"A Paper of Bar for he Apple and to tracker in detrem in around £130 Chall one cover ties, inco o a that price loks He abagar " taubg " a tone retures + " NOU SIAT THE GLADPING & GIVE general in six a accasing to activity and the company of the state of the another IN IT WITH TIVA HIS YOU AND SO the ear in his signify marched by M. Miller of a tomatic cur er, y conversor win you conso lare THE POT STY PREFERENCE > MIST FOR H this are in the overall menally conte Arin in Fig. in vec. (he Jacks Fry 5 ea since Tred have my by the . - a properties in a handy now it at you can by the goon removed to the Actor to expert it. No character they be it of care as the April 1

Mar will be were also developing a At a really * (another CP/Micke) proif he market from the corn any was to we to well be a yes and VisiCald There are v T in v w v · Plot and so on and to improve its corborate identity as well in the site 200,000 VisiCaic sales have a ware has changed its name to the rather sickly V si Corp. Which is odd really is not at least two of the Vis. " products have been written out









Once you've decided that life (or your business) can't go on without financial planning, the next problem is choosing the right package. The following report and summary table compares several (though not all) popular versions—and explains all the most common terms used in the application. It has been reprinted from the magazine "What to Buy for Business" whose February 1982 issue was devoted to the subject of microcomputers. Complete copies of the issue can be obtained (price £20) from: What to Buy for Business, 11 Kings Road, London SW3 12BR.

How then do you go about choosing the best of the available packages? The answer is that it depends on your exact requirements, as some packages offer more facilities and more sophistication than others. To help you in the selection task, our table gives all the information you are likely to need and below we go on to explain each feature covered.

- Maximum Number Of Variables/Cells: As explained above, the packages operate by holding information in a large matrix with the box formed by the junction of each row and column within that matrix known as a 'cell'. The maximum number of cells is indicated in the charts, and this is usually more than sufficient for most applications.
- Maximum Number Of Columns/Rows: The maximum number of columns and rows is also shown in the chart. Note, incidentally, that a simple multiplication of maximum rows by maximum columns does not always equal the maximum number of cells - this is because there may be restrictions on particular combinations of rows and columns.
- Maximum Field Size: This shows the largest number you can hold in the cell of each matrix (eg., 16 digit numbers etc.).

- Graphics: The chart indicates whether or not the package is able to produce automatically certain basic graphical charts from information held within the model. The ability to produce these in colour is also indicated, where appropriate. One package is able to produce a 'slide show' effect various graphs and charts can be displayed on the screen at the touch of a button in much the same way as 35mm photographic transparencies are displayed from a projector.
- Statistical Analysis: The chart indicates those packages able to undertake at least some of the following statistical analyses on the data held within the model: curve fitting; exponential smoothing; Box-Jenkins; stepwise regression; moving average; seasonal analyses; simultaneous equations (if you're a statistician, you'll know what all these mean if you're not, don't bother)
- Predefined Financial Functions: Under this heading in the chart, we indicate which packages are able to undertake automatically at least some of the following functions: net rate of return; net present value; pay back period; time interest earned; depreciation; mortgage amortisation; lag (ie, tax paid one year later).
- Command Language: A command language provides increased flexibility for the user to define complex relationships between the various aspects of the model eg. x equals the greater of a or b). It also assists in the production of printed reports. In effect, it is a simplified programming language.
- 'If...' Then...' 'Else...' Logic: This is usually associated with command language (above), and it is a type of logic which increases the flexibility of the model (eg., if profit is greater than 2, then tax equals profit divided by 2 or else tax equals 0)
- Analyse: Some packages will enable the user to identify all the data and logic elements which make up a particular item. In more complex models it is sometimes difficult to be certain how a particular figure is calculated because of a 'chaining' effect from one part of the model to another. A sales forecast, for example, may take into

Financial Planning Software Packages:

inme Of Package	DESKTOP/PLAN (I	ARSICYTC	TARGET	EXECUPLAN 1	MARS	MICROMODELLES
Price	2130	£60-£;30	£143	£.50	0042	£595-£645
anguage	Аррие soft	Assembler	Same	Machine code	Basic	Pascai
Operating Systems	Apple	Apple Commodore, CP M. TDOS, IBM Hewlett Packard, Alan	CP M	CP M	СРТМ	Apple. CP/M
faximum Number Of: artables/Cods	Depends upon machine size	16.002	1 000	Depends upon machine size	Up to 4 000	32,000
chumas	4.2	63	Total of 90 rows & columns	Depends upon macture size	98	indefinite
tows	۵00	254	Total of 90 rows & columns	Depends upon machine size	999	Indefinite
Van. Field Size	9 digita	14 digns	I, dagus	,6 digits	:6 digms	7 digits
Graphics. Bar Chart	•	0				•
Histogram	•	0				•
Line Graph	•	0				•
Pie Chart	•	0				•
Colour	•	0				•
Sinde Presentation		0				•
ististical Analysis				•		
Pre-Defined Financial Cunction	•	•	•		•	•
Command Language			•	•	•	•
f-Thea-Eise Logic	•	•				•
Loalyse			•	•	•	•
mpact Analysis			•	•	0	•
lisk Analysis					0	
Cont Seeking				0	0	•
laste Consolidation	•			0		•
Currency Conversion	•				0	•
Partial Consolidation					0	•
Consolidate Different Items	•			•	•	•
Monitor Progress	•			•	0	•
Report Generator	•		•	•	•	0
alculation	•	•			•	•
tandard Data Jeer Routines	•					
Jeer Routines					•	
Split" Data		•				•
Own File Structure		•			•	
Access To Other Files	•	0		•	•	
lack Up Programme		•	•	•	•	•
caling	•		•	•	•	
Comments	Maximum size of matrix depends on memory size of machine Figures quoted are for 32K Apple. Good value	Separate packages available for graphics and stansuch analysis. Not the most sophisticated package, but offers enough facilities for a lot of people and good value.	Separate packages available for graphics, statistical analysis, financial functions, consolidation and user routines.	Aumed at Vector Graphics users and has the advantage of being capable of interfacing to other Vector Graphic packages such as Memorate WP system.	This system is easy to use and is well worth considering unless graphics are important Stanstica, analysis is limited, but other packages	

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- with software programmable
- 16 channel 8-bit A/D convertor
- ◆ S channel 8-bit D/A converted
- X-Y analog plotter interface
- digital data input unit, 84 bits
- digital data output unit, 84 bits
- 16 channel relay control until
- 1:360 1:380

ECOS.

10000

1300

1200

B400

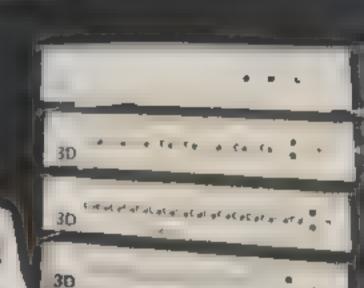
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All the above units are boxed complete with IEEE-485 address internally selectable, integral power supply, switch, fuee, indicators etc. Illustrative BASIC software supplied.

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- account historical sales data, price comparisons and economic indicators but the 'analyse' feature will enable all these factors to be identified quickly.
 - Impact Analysis: This allows you to monitor one specified variable in the matrix so that the system shows its changing values as the user amends other parts of the matrix.
 - Risk Analysis: The table indicates those packages providing facilities to undertake some form of risk analysis so that the risk associated with certain elements of the model can be determined.
 - Goal Seeking: With this feature the user is able to set particular targets and the model will show the performance required to achieve them (eg., target is profits to increase by 50%).
 - Basic Consolidation: Many users of financial planning models require the facility to consolidate information held in various models. It may be that the separate 'income' and 'expenditure' models need to be consolidated to provide a 'profit and loss' statement or it may be that models relating to different companies within a group need to be merged. The table shows those systems with basic facilities.
 - Currency Conversion: Those comparies with overseas subsidiaries will require currency conversion during the consolidation process and some packages will provide this facility
 - Partial Consolidation: Those companies owning less than 100% of a subsidiary will wish to consolidate only the appropriate percentage of that subsidiary's information and, again, certain systems provide this facility.
 - Consolidate Different Items: Another form of consolidation is to merge, and perhaps compare, but not add, data from different models. It may be, for example, that you prepare a 'budgets' model and an 'actuals' model which need to be consolidated.
 - Monitor Progress: Where the situation described above exists, some form of progress monitoring is required. Some packages are able to monitor budgets against actuals.
 - Report Generator: The ability to generate 'tailor-made' printed reports for management information purposes is provided by some packages.
 - Calculation: All packages will provide at least some
 of the following types of calculation: arithmetic operations
 (plus, minus, divide etc.),, minumum/maximum; cumulation,
 average; grow by.
 - Standard Data: Until the advent of desk-top computers and associated packages, computer bureaux had a near monopoly on the financial planning market. Although very expensive compared with the 'desk-top' solution, one advantage retained by the bureaux is the facility to access a data base of financial and econometric data. Various statistics from governmental and other bodies

(eg, inflation forecasts) can be taken into account within the model. We are unaware of anyone offering a similar service to users of the systems included in the evaluation.

- User Routines: This column indicates those packages providing facilities for the user to incorporate small programs or routines within the model to cover complex relationships etc.
- Split Data: This column indicates whether or not the user is able to view different parts of the model at the same time. This is usually achieved by a 'split screen' (explained previously).
- Own File Structure: This indicates those packages relying on their own file structure for data, as opposed to making use of a conventional one where the data can be manipulated by other application programs.
- Access To Other Files: Some packages will allow the user access to other files, usually to transfer data. It may be that information held in the sales ledger is applicable to a particular model and in such cases it is advantageous to be able to obtain that data as and when it is required.
- Back-Up Copy Of The Program: Any floppy disk is liable to damage which would render it 'unreadable' by the disk drive. Program disks are no exception and if you need to buy a new one each time it is damaged then this could be quite an expensive operation. Various procedures apply to copying different programs, so it is always a point worth checking out. Some, packages will allow you to copy the program itself while others require you to send back your disk to the supplier for replacement (at a cost and with at least some time delay).
- Scaling: Some packages allow numerical data within particular columns and/or rows to be 'scaled' (ie, all figures in this column represent thousands of pounds).

Conclusion

All of the above should be a pretty comprehensive guide to the features to look out for. Having read all of this, it should be clear just how sophisticated these packages can be as a management tool. It may well be worth getting a computer mainly in order to use one of these programs, and if you are getting a computer anyway, their relatively low cost should make them more attractive still. Now on to the tables.

Financial Planning Software Suppliers:

Below are originators, distributors or in some cases principal suppliers of the financial planning packages mentioned in the table.

DESKTOP/PLAN II: Personal Computers Ltd.,

194/200 Bishopsgate, London EC2, Tel. 01-626 6121

EXECUPLAN L' Almarc Data Systems Ltd.,

Great Freeman Street. Nottingham. Tel: 0602 52687

MARS: Sapphire Systems, 19/27 Kents Hill Road,

Benfleet, Essex. Tel: 03745 59756

MICROMODELLER, Intelligence (UK) Ltd., 30 langüe.d Road London 5W19 Tel. 01 947 9846

TARGET: Comput-A-Crop, 3 Commarket, Louth, Lines. Tel: 0507 604271

VISICALC: Available almost everywhere:

FCS-EPS, not reviewed here but available from EPS Consultants, Boundary House, Boston Manor Road, London W7 Tel: 01-579 6931



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The Osborne is without doubt a remarkable breakthrough in microcomputing. First, because it is significantly cheaper than anything else on the market which includes screen, twin floppies, 64K RAM and typewriter keyboard. Secondly, because the price of £1250 plus VAT includes £800 worth of standard software pickages such as Wordstar and Supercale. Last, and by no means least, is the fiet that the Osborne is portable, and can even be powered by an external battery pack if you can't get to the mains.

that would previously have been impracticable on the grounds of cost, or physical size

We are offering an Osborne 1 as a prize for the most original suggestion for such a apparation. This can be at the area of basiness professional oil cat the bound home usage and we are looking for suggestions that are imaginative, well thought out and would note the next use of Cosborne's features.

Entries should be submitted (preferably typed) in the form of a short essay of not more than 400 words, and should cover the background to the application, what software we also become to be written, and any additional hardware that what he nyelyes

The jungest are Michael Heavy Monaging Director of Osborne Computers Ltd., and the Editor of MicroComputer Printout Entries to Osborne Competition, MicroComputer Printout, P.O. Box 2, Goring, Reading RG8 9LN

One entry into per hands ple on in the size to include this is upon town, take for the impet to not a correct that entry is not in a corner.



The ACT Sirius 1 is more than the UK's best selling 16 bit personal computer it is the only one with such a large of a celof 16 bit software. Business and scient fic programs specially developed to take advantage of the high speed 16 bit Intel 8088 microprocessor at the heart of every Sirius.

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nology and the powerful 16-bit software that takes tull advantage of it

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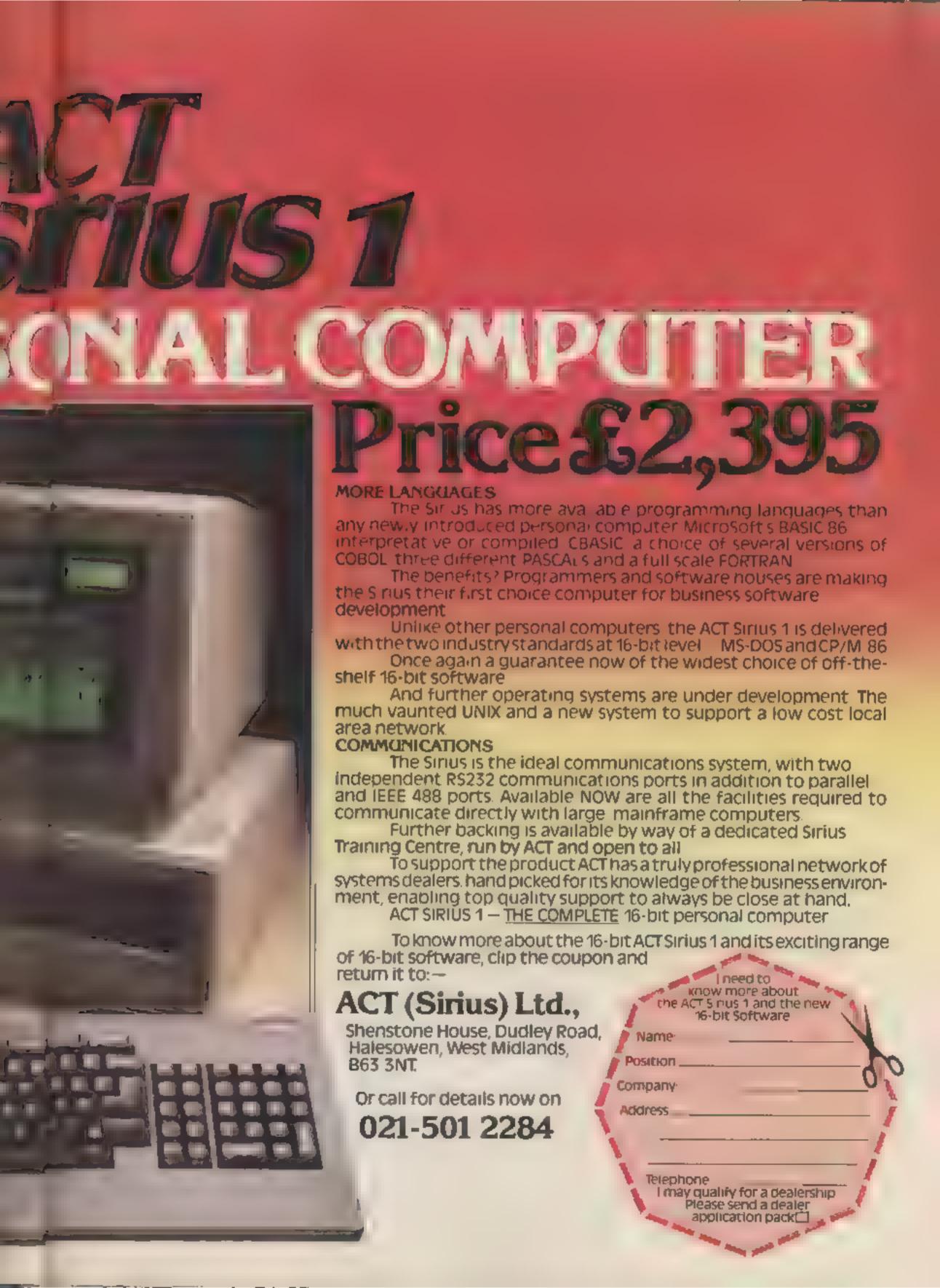
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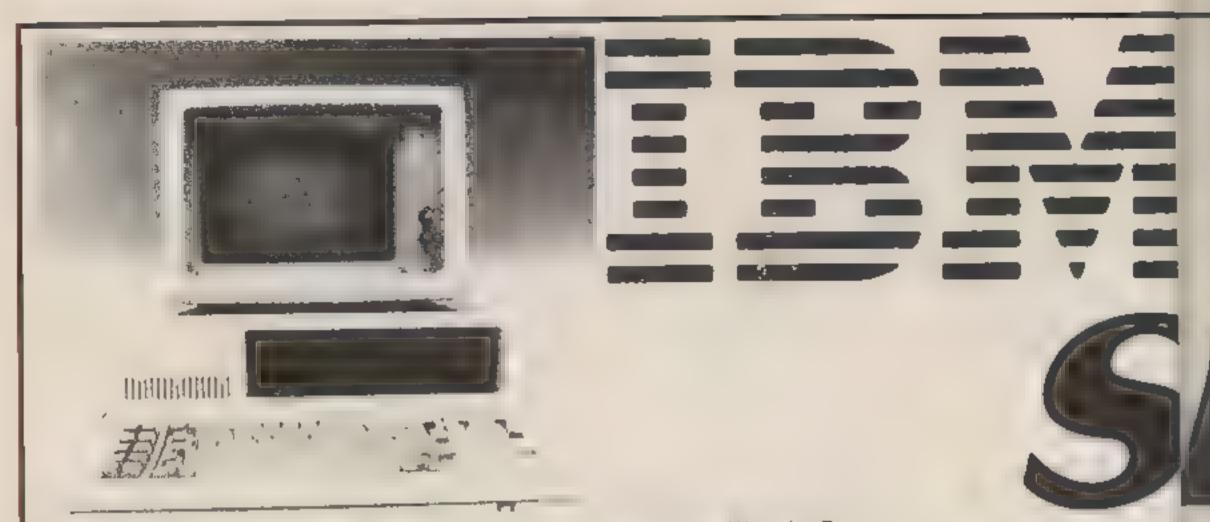
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Which of these two 16-bit Super micros will win?

Gentiemen geni emen please I need complete silence for this, one of my most delicate dissections. Before you lie two species from the genus Bigselium Micrus, comparatively new in evolutionary terms but proving already to be a success." The requested hush fell upon the audience, every member of which tensed as the professor carefully placed his dissection, implements in heat little rows on the scrubbed table.

Delty Professor Todd Sweeney removed the outer ayers to reveal the entrails, which bit by bit he removed from the grey coloured bodies of the two microcomputers. Slowly and with the care and precision that had won him international fame he removed the hearts of both. He held them up to the enraptured audience. A chorus of gasps went round the room. They were witnessing the heart that was said to make those two species so much more powerful than other species in the same genus.

The professor studied the heart of the matter closely for a moment is avouring in the theatrical manner he found so use turn amateur dramatics, the collective awe of those who his come to see him perform. Finally, he proclaimed: "This ige!! Temen is the intel 8088.

Looking back in the lecture notes of the professor's students the importance of the Intel 8088 became clear. It was a cheap microprocessor that did its calculation using binary numbers that were 16-bits long, twice the length of most of its predecessors. What simore it had been used in, evolutionary speaking, one of the most important microcomputers of this decade, the IBM Personal Computer, or IBM PC.

The IBM PC sprang out of the company that produced and still produces) the dinosaur of computing the main frame IBM came from the same mould it was a huge powerful and dominant company. Any move it made sent tremors through the whole computing industry, though for a while microcomputing managed to scurry unnoticed around its ankles.

No sooner had IBM decided to make a micro than Chuck Peddle, the man who designed and populated the globe with Commodore PETs, determined to produce a strikingly similar machine, which can be seen in the UK bearing the name Sinus.

Both the Sir Us and the IBM PC represented an important development in the micro industry, because they were the first cheap business micros (both costing under £3 000 in olding floopy disk drives for storing programs and data) to use the powerful 8088 microprocessor.

Naturally the professor could not pass up the opportunity to open up the Sinus and iBM PC to find out what was in side. For example, the disk drives. Careful examination revealed that the Sinus had disks that could memorise 600 Kilo bytes each, whereas the tBM PC he examined offered only 160 Kbytes each. Would this he speculated make the tBM PC have a harder light for survival in the jungle they call personal computing?

He also found big empty spaces, room enough in the Sirius for up to 896 Kbytes of internal memory, the memory the machine uses when it is processing. The IBM PC had room inside for up to 512 Kbytes.

Using that miracle of modern science known as the mains switch he brought both subjects to life. Two green eyes winked at him, one from each machine.

He noticed that the eye of the Sirus, the 12 inch screen with a special surface to prevent reflections flashed up a iffle picture of a floppy disk and an arrow. If was trying to tell him something, to put a disk into one of the drives.

The IBM screens, 12 inches with the anti-glare surface like the Smur started off flashing only a thin green line about inch long. But then it emitted just one short "beep" which told him all was well if all was unwell the machine would have emitted two beep.

Unlike the Sir us two beeps was the nearest the IBM PC would get to saying what sithe matter with itself when first furned on. The Sirius displayed error messages. Some were useful, saying for example, that a system disk hashit been loaded. Others less so, at least for the amareur.

At the MicroComputer Printout International University of the Furtherance of Thought and Academics. Salar es (MCPIUFTAS) the study of species like the IBM PC and the Shibs did not stop at dissection. Down in the combined sociology, anthropology and coffee consumption monitoring unit was to be found tank-haired ex-Grosvenor Square Riots cheer leader. Professor Zed Pizzaz.

Pizzaz had been studying the behaviour patterns of microcomputers in a societal context for some time now, and he was soon putting the Sinus and IBM PC through their paces

He wanted to assess input to and output from the micros and the behaviour between them. The input for both came in the form of the neat detachable keyboards which connected to the main body of the computer via a telephone-type coiled cable.

This, Pizzaz fell, would encourage the Sinus and iBM PC nto all sorts of strange environments, such as the lavatory



A very unusual investigation.

where their owner would be able to use up valuable time by programming rather than indulging in the usual aimless conlemp at on

The only trouble would be that the screen would normally have to remain outside.

The BMPC's keyboard was a joy to manipulate Pizzaz's siender fingers found the soft click that accompanied the pressing of a key particularly satisfying. The keys available rendered the PC's heart, the central processing unit, easy to manipula.

The Sir us keyboard was good, but not as good as the PC's, and a few of the keys were not implemented when the machine was running the software supplied. This resulted in dysfunctional behavioural characteristics in certain social contexts, characteristics which Pizzaz noted with pleasure had yet to be embraced by the lexicographical conventions and norms of the computer's epistemotogical matrix.

The Sixus processor in other words was not capable of understanding some of the signals sent to it from the keyboard. But this was no generic problem. With software that will become available on the Sixus, the appropriate keys will be implemented. Using the word processing package Wordstar, which was supplied to Pizzaz in pre-release form the only important key that wouldn't work was the pound sign. This could be temporarily overcome with a capital 'Li over struck with an equals sign. The released version should have at the keys working.

Pizzaz's next wish was to learn about the output of the two machines. Interacting with the outside world, as he had said in his paper given at the annual Sociologists' Spheroid Object. Used in Game Behaviour (also known as the Sociologists Bali) is a difficult thing.

Both machines did it via their green screens or an array of plugs on their back-sides. So that a female plugican male with a male one to use the partance of MCPIUFTAS's engineering and psychology departments, standards must be kept.

In the case of both machines, the standard was cared RS232. Because they had RS232 plugs on the back, both could be plugged into most serial printers (ones that have to take in bits of information, one bit at a time). But only the Sinus could connect to a parallel printer (one that can cope with a number of bits of information at a time), unless the IBM PC had a special adaptor plugged into it.

Both machines had the capability to talk to networks of other computers

But the IBM PC with the backing of iBM and an industry biting at the bit loget in on the act and supply lots of add-ons was capable of expanding out of recognition, at a cost. A carefully designed "mother board", the printed circuit board that carries the main components, had a number of slots for enhancements as well as extra memory.

Pizzaz, who liked putting things into their societal context and contemplating their role in the demographic fabric thought that the plan for the IBM personal computers was to link them into an international network. As one of Pizzaz's colleagues, Pierre Shakes from the languages department had put it. They are just a few strands in the wide web. BM is weaving over the world.

But being of essentially the same nature, anywhere the BM PC goes, the Sir us could follow, given Peddle's plan to take advantage of IBM's influence.

Some of Pizzaz's colleagues may have regarded this practice of one machine trying to ape another as constituting a display of abertant behaviour values. Hardly so in the world of maintraines copying BM sia well-established norm and arises out of iBM's dominance in the computer manufacturer's social grouping. The pack leader is often emulated Pizzaz' had observed at a recent sociologists conference. Other members of a group copy their leader in order to establish a piace in the community. Only a few strongly piaced members, with an established position lowards the top of the hierarchy and a robust peer group rating can afford to assert an independent role.

Reflecting Pizzaz's own elevated position in the sociologist grouping the audience had nodded furiously in agreement

As part of the project Pizzaz had to assess the appear ance of the machines. He had to do this, he explained to the trustees of the MicroComputer Printout Baham an Investment Fund who had provided the finance, in order to establish their (the machines, not the trustees) role in the display ritual

Both were attractive, though Pizzaz felt the warmer brown greys of the Sinus, and the ergonomically admirable adjustments that can be made to its screen would be a iffice more likely to attract suitable partners.

The design of both machines would he felt attract the appropriate people, who he estimated would range from Corlt na drivers living in joined-up houses (socio-economic group C1) to Mayfair curb-crawlers and Earl Grey tea drinkers (socio-economic group A/B), and include the normal people in between (who didn't really interest Pizzaz at all)

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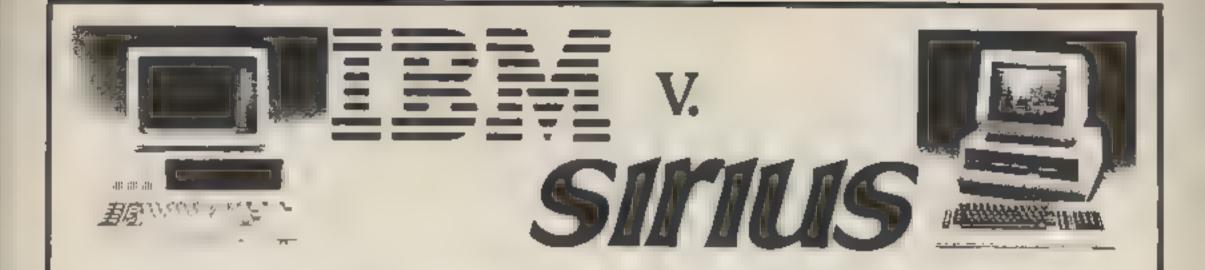
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The IBM PC also had a little extra display ritual supplied with the systems disk. A selection of games, some of which can only be run with an add on colour/graphics board provided an excellent means of establishing a rapport between human and machine. Pizzaz spent many hours guiltily playing tunes using the music program, and running the mortgage program to work out when he could afford the prenata. Intant rehabilitation centre of his dreams.

Before passing on the machines for further evaluation, Przzaz had to present a report to the MCPIUFTAS Vice Chancellor. He concluded that given the inaccessibility to some of the IBM PC due to its price, the Sinus would be the better bet

But he also noted that the IBM has the advantage of having the biggest computer in the world behind it, probably of fering some of the best support and potential for expansion

As was his wont, Pizzaz concluded that the choice between the two would have political undertones, as to go for the IBM would involve engaging in a (possibly fruitful) long term commitment. He didn't expect to find a heavy population of either machines in the domestic environment.

The two machines were next entrusted to the technical assessment department. Sid, who was in charge of the as sessment took only a few days to reach a preliminary conciusion.

Sid wrote. "The 16-bit rewrite of the CP/M which was runing on the Sirius had two incompatible t/O subsystems which meant we had to bootcopy the system tracks on to the Supercaic and Wordstar before we could run all the applications packages without a reset. The MSDOS we had up on the BM PC which is basically a CP/M with friendier command leve, syntax and easier error message codes, performed much the same, but with the 20-bit addressing and 16-bit in ternal architecture of the 8088, a few lines of Pascal code ran faster than on convent onal 8-bit kit. When the 8085 comes on line with the 16-bit data bus, we expect better throughput, though it is hard to tell. The full potential of both systems will be available when 16-bit software, rather than converted 8-bit software, becomes available. The Microsoft Basic 86 was woeful, but a new version is in the pipeline.

"What?" asked the Vice Chancellot to whom Sid was reporting. Sid went over it again, relating how much of the software written for the machines was converted from software written for the less powerful 8-bit machines like the Apple and PET.

This meant that the full potential of the processor uncovered by Professor Sweeney was as yet not being exploited. As well as this, some of the software for the Sinus could only be run after the machine had been used with different programs by switching the system off and on again.

But as Sid pointed out in his occult way, both these problems should be solved as and when more software becomes available.

One major shortcoming of both was the version of the programming language Basic they used. It had been especially rewritten for the Intel 8088 processor, and as a result rather than being better than the Basic used on the less powerful 8-bit systems, was in many respects worse.

Sid showed the Vice Chancellor a simple example If either machine was asked in Basic to multiply 0.6 by 100 the answer that came up was 60 00001. The reason for this again, is that the full potential of the processor hadn't been tapped, and when the suppliers, Microsoft produce a full blown version of the language, the problem should be solved.

But Sid concluded that using either machine for word processing or financial modelling proved very rewarding. He pointed out that when he searched for a word in a piece of text several thousand words long. It would be found almost instantly, and appreciably faster than with an 8-bit system.

The Vice Chancellor was left with the task of pulling together the reports of Pizzaz and Sid incorporaling the findings of Sweeney and producing some conclusions for the Micro-

Computer Printout Bahamian Investment Fund trustees

He thought of doing this with the help of philosophy Prolessor Reg Toenail, but then he didn't feel like having to spend most of the time defining his terms

It had been pointed out to him that the BM PC is not yet available in Britain from IBM. Companies had brought it in on their own behalf, buying it from American stores who obtained deliveries direct from IBM.

This could have meant that IBM would launch a special European version one sufficiently cheap to meet the Sirius head on But as things stood, the Vice Chancellor felt that the Sirius offered better value for money, who could argue with more memory at less cost?

Nevertheless, the name alone was enough to attract considerable interest in the IBM and as Pizzaz had said the choice is more than a question of price to some customers. Some people want in on the IBM act from the start

"Gentlemen." said the Vice Chancellor trying with effort to follow protocol and affect a bow. "Here are the combined reports of the surgical department, the sociology, anthropology and coffee consumption unit and the technical assessment department."

"Good, good," the Trustees murmured in unison, "and which of these two subjects would you say is more likely to survive the rigours of the outside world?"

The Vice Chancellor thought a while and eventually asked if he might sit down

'There is not a lot in it, gentiemen. On the one hand the Sinus is cheaper and is highly regarded in terms of design and on the other, the IBM PC seems better prepared for the moment. A lot of the extras for the Sinus have yet to arrive, and the documentation we had supplied with the Sinus was not the final version.

The Vice Chancellor's prevancation was true to form But, as he could have guessed, the MicroComputer Printout International Group, a big user of IBM mainframes, favoured the IBM PC on the basis of the report. Individua, MCP UFTAS departments, on the other hand favoured the Smus



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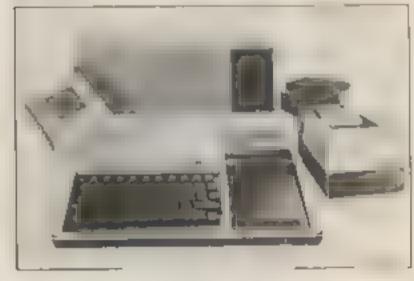


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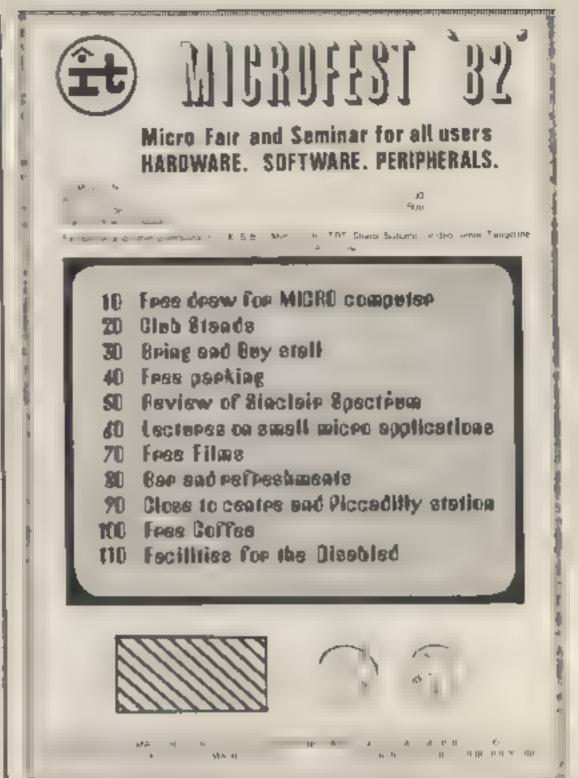
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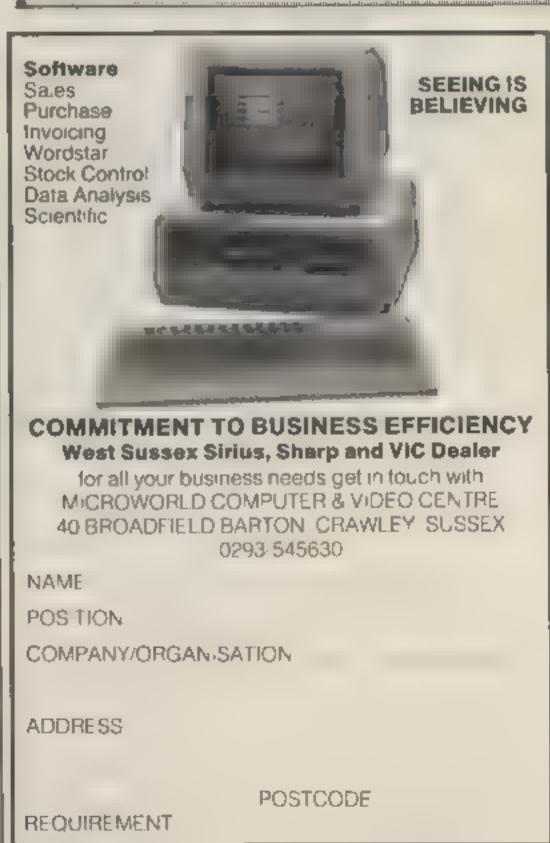
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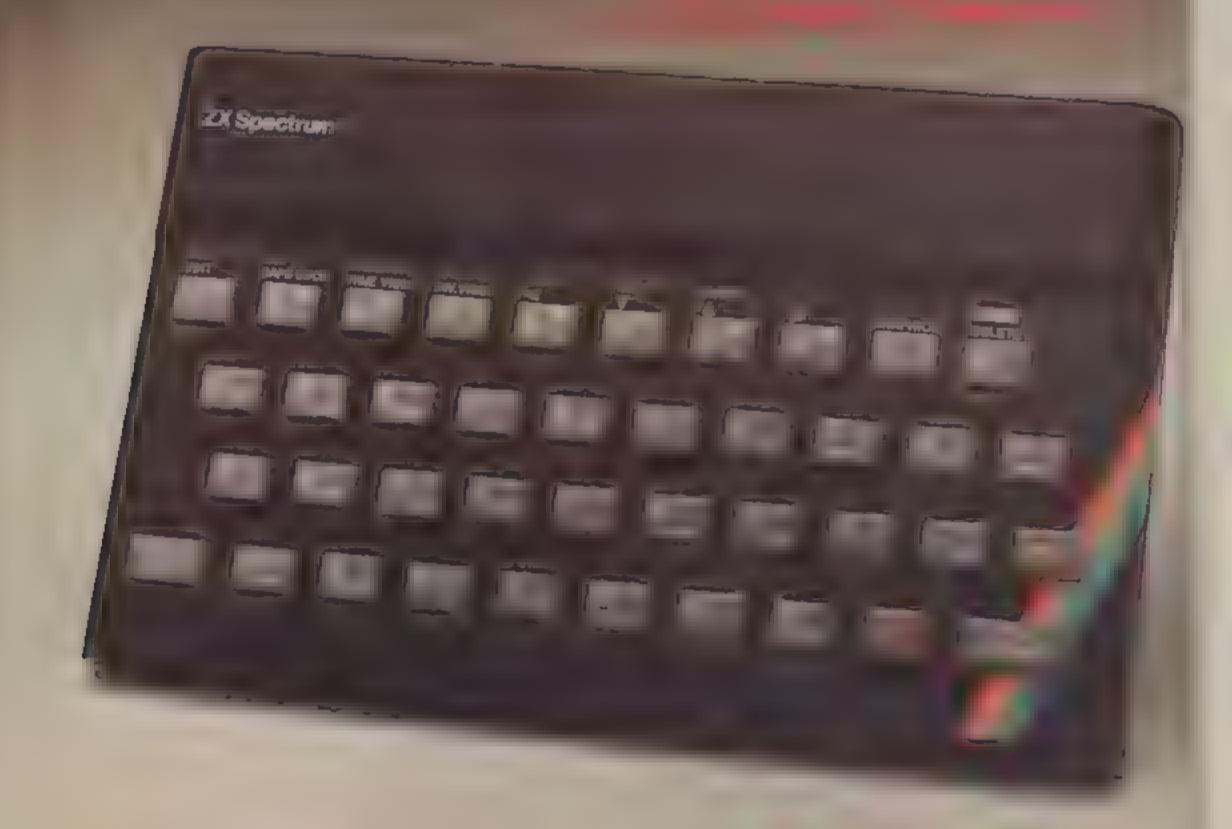
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SINCLAIR'S SPECTRUM



The Sincial r ZX Spectrum is a personal computer with a difference it comes pre-programmed with one man's personal vendetta against a massive organisation. Quite apart from C live Sinciair's unique record of creating high technology consumer products at significantly lower prices, the Spectrum's design clearly reflects the man's resentment at not being given the contract for the BBC Personal Computer. The fact that his ZX81 has outsold all other British micros put logether added insult to injury. Hence his determination to produce a higher specification competitor for less money.

Even the colour brochure for the Spectrum reflects this sent ment, with Sinciair himself unambiguously declaring that "We believe the BBC make the world's best TV programmes - and that Sinclair make the world a best computers?" With characteristic dry humbur at the press. lautich he revealed that one possible name. for the project had been 'Not the BBC' computer. Having performed our own. evaluation and testing, we would not go along with Sinciair's claims that his new baby outperforms the BBC Model A on all fronts It does however incorporate a number of extremely sophisticated features. that make most other colour home computers. look positively neel thic by comparison. Interms of value for money, the Spectrum. leaves them an standing - costing £125 for the 16K version or £175 for a full 48K.

So let's start with a brief run down on the features offered. The ZX Spectrum is a colour home computer which plugs into a domestic TV set. Up to eight colours can be used for text, block diagrams, user defined characters, and high resolution graphics. It has a keyboard with movable – though not typewriter quality – keys, and a small built in speaker to provide sound effects. It interfaces to a domestic cassette recorder for storing programs – and can load and save them faster than other systems. It is programmed in BAS C (or machine code. Of the 16K of RAM, around 13 SK is usable.

Micro prices

When reviewing a new home microcomputer mention of the periphera's and expansion fact ties is usually left to the end, since few potential purchasers will be inclined to tork out the requisit additional greasy oncers. In the Spectrum's case, however, the low-cost devices under development at Sinciair (to say nothing of the many hundreds of independent small companies) represent a

major selling feature

First, there is a memory expansion for a cost of around £60 it will be possible to upgrade the 16K machine to 48K with a plug in pack. That is likely to mean that only those intending to run business applications with the Microdrive will thill ally purchase the 48K model.

The ZX Printer (available now at £60) will



also run on the Spectrum – and can print in both upper and lower case. The BASIC commands built into the Spectrum can LPRINT to the printer LLIST a program or COPY the screen onto the printer – including high resolution graphics. The ZX printer prints up to 32 column width on electro-sensitive paper, at 50 characters per second.

Built into the Spectrum's operating system is the software to drive an R\$232 port, and for around £20 you will be able to purchase the hardware part of this interface and thus access a wider variety of printers, moderns etc. This interface also includes a networking system that will allow a number of Spectrum's to share common peripherals—for use in schools, for example.

Great Microdrive mystery

The most interesting development, and the one that is causing Sinclair's competitors the most anguish is the Microdine ia mass storage device that can hold up to 100KBytes of programs and data for fast retrieval yet will cost only around £50.

Again, the BASIC and operating system has commands already built in to handle up to eight Microditives – which could wer make the Spectrum the cheapest business system on the market

The Microdrive is clearly uncle Ctive's most closely guarded secret, and the compact (3" x 3" x 2") exterior gives no clues as to what it contains. Most pundits believe it to be a 1" disk drive. Our opinion however is that it is actually a new form of cartridge tape system – similar to the Stringy Fioppy and Floppy Tape ideas atready developed. Our reasoning, and it is only hypothesis is given below – for those who are interested.

1) The name - Microdrive No matter what the actual performance ligures, a disk is a more marketable animal than a tape. Had Uncle Clive developed a revolutionary 1" disk, he would almost certainty have called it the Microdisk 2) Though the data transfer rate is extremely fast (16KBytes per second the average access I me (the time taken) to find an item) is not. From the brochure, the ligure given is 3.5. seconds which means that the maximum access time should be 7 seconds. But 7 seconds times 16K per second is not far different from 100K the capacity of the drive. Which tends to suggest that it could be a continuous loop tape circulating at a constant speed. We are certainly prepared to be proved wrong.

Construction

Starting with the outside, the Spectrum's casing is rather wider than the ZX81 but of similar construction, rugged plastic sher and low profile design. Sinciair employs an industrial designer to improve practicality and aesthetic appeal, hence the rainbow tash across the corner of all Spectrum products.

Sockets at the back are for power supply (same transformer as the '81) casset e recorder. TV (the UHF modulator is built into the Spectrum — unixe some home computers) and the expansion port effectively a continuation of the Z80 bus to drive memory and per pherais.

The screen

The screen is the face of a computer where it expresses itself and the feless black and white © 1982 Sinciair Research Ltd message which appears on switch-on gives

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no clue to the vast range of expressions possible. The screen is divided into two areas, a central portion where programs are isted and output is printed in the form of colourful text and graphics, and an outer border which can be specified as being any one of the eight standard colours (blue, red magental green cyan yellow white and black). The bottom two lines of the screen (i.e., in the border) are used for entering program lines and keying in responses to NPUT statements. If more than two lines are needed then this area is automatically expanded, and the rest of the screen scrolled upwards.

The main screen thus consists of 32 x 22 character positions – which may contain standard ASC-I characters (upper and lower case) any of the sixteen standard graphics symbols (which basically provide all the combinations of quarter squares within the block) and your own user-defined characters which can be assigned to any of 21 keys. The latter are very powerful in that they can be used for special games symbols, foreign language alphabets and so on – though of the graphic facilities they are by far the most difficult to use – involving the POKE USR and 8 Nitunctions.

Each of the character positions on the screen has associated with it a set of "attributes" defining its graphic status. This covers the foreground colour (aftered by the INK command) background colour (PAPER) and whether or not that position is to be shown extra BRIGHT or FLASHing continuously. This attributes system is similar to that used on Teletext displays and is one of the reasons why the Spectrum is so efficient in memory usage, particularly for graphic displays.

High-resolution graphics

Using the high-resolution graphics (which can be super imposed on any other text or graphic displays) it is possible to turn on, or off any of the individual pixels on a grid of 256 x 192 dots. Commands are incorporated into BASIC to draw lines, circles and arcs. In order to speed up the design of displays. Though the hi-res graphics can make use of any of the INK colours, it is still only possible to have two colours within any one character position, so you are not completely free to produce hi-res designs in any colours. It does, however, mean that even with a full hi-res display. 9K of user memory is still available.

Keyboard

ZX81 owners will undoubtedly be wondering "Has the keyboard been improved?" The Spectrum's keyboard does have distinct, movable keys – which, though smaller in size do have the same pitch or spacing as a typewhier, with the exception of the space to the

The keys, however, are made from rubber (inside Trader suggests that falex was the material employed) and have a rather spongy feel to them – similar to many pocket calculators. More positive feedback is provided with the help of an audible click.



from the speaker for each key press. As keys have an automatic repeat function if held down.

fach of the keys has a multiplicity of functions ascribed to it (as many as seven in some cases), though unlike the ZX81, Sincial have made good use of colour to avoid too much confusion. We found the labels printed on the surface of the keys difficult to read in some lights, and likely to wear off – though this defect may well be corrected by the time the production models are shipped.

The various functions are differentiated between by means of two different shift keys and a variety of operating modes indicated by the reversed out letter that acts as the cursor. For example, there is Keyword mode where pressing P will cause the word PRINT to appear. Graphics mode for special characters and Extended mode for other commands.

This does take a considerable amount of getting used to and is extremely confusing for the beginner. Once mastered, however it should save time, typing errors and temper. We found it an improvement on typing at keywords out in fair

Alas editing of mistakes or making alterations to programs is rather less straightforward. The Spectrum uses a similar system to the ZX81, and while this is acceptable on a machine in which memory is the principal constraint, the decision not to other full screen editing teaves the Spectrum at a disadvantage in comparison with Commodore's VIC. The procedure involves moving a pointer up and down the listing unit, the erroneous line has been reached, and then selecting EDIT to bring the line down to the bottom of the screen. To be fair, however, this is by no means the worst of the editing systems we have seen

BASIC

Spectrum BASIC is an extension of the original Sinc air BASIC amployed on the 'B1 and which Uncle Clive claims is "rapidly becoming the standard". This claim is presumably based on the sales of over 400,000 ZX80 and 81s. Though it will not be possible to load '81 tapes onto the Spectrum most programs will transfer across if retyped. The differences appear to be well documented. We noted with interest that the functions READ DATA and RESTORE are now incorporated — thereby contradicting. Sinciair's earlier insistence that the lack of these functions was not a major omission and could easily be programmed around.

Sinc air BASIC is undoubtedly a very user-friendly language – both in things like the one-touch keyword entry system, and the number of very high level commands for coping with graphics and the like.

Cassette

Many such commands are associated with the cassette system – which has been speeded up seven times to 1500 Baudilit now incorporates the means to cope with the widely varying recording levels found on domestic cassette recorders.

In addition to the normal SAVE. LOAD and VERIFY (i.e. check that a program has recorded properly) commands, there is also a factity to MERGE subroutines from tape into program you are developing. Furthermore, the first three can be used not just with programs, but to save arrays of data, any sized sections of memory, and even screens of text or graphics. All of these blocks of data can be saved with names in the same way as programs.

Finally, there are one or two additional features we think worth mentioning. First of these is the BEEP command, which controls a note of specified pitch and duration to be

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Though everybody has heard of the programmer's revenge have yet to meet the programmer who has taken it. The classic revenge story of course, is of the programmer who so fixed his payror entry that if he got fired, when they came to take him off the system, it would wipe out the entire file.

Variants of that have been around for all least fifteen years. And for a long time, I thought that wiping out the file whatever it might be, while not subtle, might still yet be the best revenge. Until I heard the following, which I am fold has since surfaced in everything from comics to textbooks. Even so you may have missed it.

It was the early days of time sharing systems. The particular system at the research laboratory in the USA kept on going down, and stopping for no particular reason. Or so I seemed, but it happened so frequently that eventually mischief was suspected.

Misch of was verified. Mischief was a program called RHBOMB, submitted by a programmer whose initials.

were RH RHBOMB always seemed to be in the system when the system went down iprinting TSS (for Time Sharing System) HAS GONE DOWN

RH was spoken to, and was to dithat if thappened again there would be serious trouble. And RH went away everyone thought suitably chastened.

Some months later a programmer browsing through program istings came across a program called RHBOMB. Not wishing to get kill into trouble without first checking, he sat down at the terminal to call up the program and look at it.

callit up and then typed in LIST RHBOMB

The terminal reacted

mmediately. No listing instead back came the phrase TSS HAS GONE DOWN, And then the terminal went dead. Whatever he typed in, there was no response.

But this was incred bie—a program so virulent that even a simple call to list the contents managed to wipe out the system. The programmer rushed out of the room down to the computer centre to discover, if he could, what had gone wrong, and why it had done so.

He did so prematurely, for TSS it turned out, had not gone down except at his terminal. This RHBOMB was a very simple program. On being queried, all it did was to send the

message TSS HAS GONE DOWN. It then immediately instructed the computer to send, and keep on sending is continuous set of clock pulses to the terminal which of course were just at the right speed to lock it. And that in turn, meant that it was never able to signal back to the CPU that it was ready for the next task.

It was not recorded what happened to the programmer who wrote version two of RHBOMB

The early days of computers were not the most reliable of days, either of machines or equipment. And led in turn to a host of terse and other one liners which tried to a diffee weary.

Sattinger's Law

It works better if you plug it in (I was for some years to make extensive use of this, and added my own footnote

Malik's Corol ary
If it still doesn't work, try
switching it on

been down this route, and one had produced Caan's Axiom

When all else fails, read the instructions

Most of the one liners have been American, but Europeans were not to be left out of this law-making

There was Hoare's law

Inside every large program there is a sma program struggling to get

And then there were consultant Tom G ib s Laws of Unreliability

Computers are virite after bit hilmans are even more unreliable

Corollary At the source of every error which is

blamed on the computer you will find two errors including the error of blaming it on the computer.

Any system which depends on human reliability is unreliable.

Investment in reliability will increase until it exceeds the probable cost of errors, or until someone insists on getting some useful work done.

But the last word on all this has to go to former US television commentator. End Sevareid He was not taking about computers though he might we have been And he said this

The chief cause of problems, is solutions



ALGURITHIS

What are algorithms, and are they of any relevance to the microcomputer user? Chris Preston looks at solutions to some of the classic problems.

Aigorithms form the basis of Computer Science It is often said that these aigorithms are very complicated difficult to understand require higher degress of maths leto. It is also said that if a young maid catches a load at

midnight and releases it after muttering a few words, she will be marned within the year. Which just goes to show that you cannot rely on what other people say. Unless hase people are writing to you in MicroCampide. Printout, if which case you may carry on

Before we get too involved in the subject perhaps we had better decide exactly what an algorithm is An algorithm is just a general method for solving a particular problem. For example, consider the problem of getting back into your house after an evening at the local layern.

- 1 Select a key
- 2 Insert in lock, and turn

- 3. If door opens, go to step 6
- 4 Select next key and go to step ?
- 5. If no more keys, try next house.
- 6 Enter has and prepare to dodge flying objects and/or roiting pin from loving spouse
- 7 End

We normally do not need to write an algorithm down for such a simple task, we do it automatically. But there are many cases in maths, and in programming, where the method of solving a problem is not tembly obvious and in these cases we might have to think up an algorithm for the problem before actually sitting down to write the program.

The oldest non-thylal algorithm (know of dates back to Euclid and gives a rule for finding the greatest common it visor of two not negative integers. In this article we will be looking at various 'standard problems of computer science. Many of these require a tile more theory than we have room for in a short article, but hopefully your interest will be stimulated enough to make you want to land out a bit more about the subject

Computer science

One very interesting branch of computer science is comparing different methods of solving problems. The process of analysing all gorithms is however quite technical, so we

will not go into the theory in any depth here. However, there are many methods which are shown up by such analyses which can be used in ordinary programming. One thing we will bear in mind is how long a particular algorithm taxes. Most algorithms work on a set of data, containing say in records. We might have an algorithm whose time is proportional to n and another whose time is proportional to no line general we would prefer the first, be-

cause the graph of ninses more slowly than that of nil However, the graph of nimight be a very steep one, so that the graph of nil does not overtake it for a long white. An example of this is the insertion sort, which is the fastest sort known for very small numbers of thems say up to 16 or 20, a though it gets very slow indeed for large in. The insertion sort is the method you probably use yourself to put a new page in a loose-leaf book. You just look down at the pages till you find the right place make room for the new item, and then make the insertion.

What sort of algorithms are we likely to most and what can we earn from them? Or a very fruitful area for the algorithm hunter is the sort. The simplest sort of algorithm is also and

ahout the slowest the Bubble Sort. Say we have in records we want to sort. The way it works is that you start at the beginning of the st, and compare the first two records. If the second is smaller than the first you swap them. You then compare the second and the third record, then the third and the fourth, up. to the nih. After the first pass, the largest record will be at the end of the ist so next time. we only need to compare up to n-1, and so the procedure goes on. It gets its name from the way the largest record in the set rises up brough the set like a bubble in a liquid. The e laken for the sort increases as no solf. y is a make he number of items. The time p by four Alternative sorting a. parthres can achieve a sort time proportional c n x belier

'Greedy' algorithms

From an algorithmic point of view, why is this method is the law top a two as which are next to each other and in the correct order. They will so be compared on each pass of the data desprite the fact that they will never be swapping or the lagorithm would

examine each item only once and that in his cally put them ar into the correct order. An all gorithm which only needs to examine its input data once is called all greedy algorithm.

Another problem which can be solved using the greedy method is the Knapsack Problem. We have a number of ortice's which we want to put into a knapsack, which has a capacity C. The weights of the objective held in array W(r) and for each objective add in, we get a profit P(I). We can also add a fraction X(I) of an object in which case we

riet a profit of X(I)*P(I), at a weight cost of X(I)*
W() The idea is to lift the knapsack so as to maximize profit. Several simple algorithms since glomind such as always to add the object with the most profit. This however is not until because although total profit rises of ckiy, we cannot add many items before the knapsack is full. Learning from experie we weight decide to add the lightest object next, but this doesn't come in quickly enough. The optimal algorithm is to add the

object which gives us the maximum profit for the capacity used. In other words, the object with the highest value of P(1)/W is

The problem becomes even mole in eresing when it comes to writing a program in the knapsack. At first sight the simplest way is to place the objects randomly in the array then search for the one with their ighest value of P(I)/W(I). This is very inefficient because we are calculating this ratio for each unused.

the calculations over again! A better way is to calculations over again! A better way is to calculate all the P(I)/W(I) at the start and put them and another array. V(I). However, we all have to sea childrough V(I) each time we prix an object to the method is still very was eliminated the method greedy, we have to sort the objects into descending V(I) so that we know exactly where to find the next object. In fact, we up not even need to store

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If the V(I) as long as we know that the objects are in the right order. Here is a greedy BASIC program to solve the problem, which assumes that the values in P(I), W(I) and C have already been set up.

GOD FOR I-1 TO N

10.0 IF W I + C THEN I=N GOTO 1040 REM TEST IF ROOM FOR

ALC OF MEXT OFFECT

ADDO R & +1 REM PUT OBSECT INTO KNAPEAUS

DOD C-C W(1) REM DECREMENT REMAINING CAPACITY

.G4G NEXT REM MOVE TO NEXT OBJECT

DIG IF I'N THEN I I'-C V I'S REM PUT IN PART OF NEXT

CBUECT

The program will put the objects into the array X(I)

Job sequencing

Another sim ar problem which is maybe a lift Its more applicable to modern life than put Ing objects into knapsacks (with apologies to Baden-Powell) is the problem of tob sequencing. Here we have a set of nijobs. each of which has to be completed by day. D(I) to earn a profit P() Each job takes one day to perform, and we only have one machine on which to do the work. Say we have four jobs, with profits 90, 25, 50, 30 and dead nes 2, 3, 1, 2. The basis of the atgorithm is that the next job we do is the one with the largest profit provided that it can be done by its dead the We start off by choosing. the job with the largest profit in this case job number 1. The next highest is job 3, but this has a deadline 1, so we must do job 3 first then job 1. The next highest profit is job 4, but this has a deadline 2, and we are going to be busy for two days doing jobs 1 and 3. The only other job is job 2, which has a deadline of so we can fit it in after the other two jobs. Poor old job 4 is going to be left undone!

There are many other problems, more complicated than these which can be solved by the greedy method. A typical one is the Shortest Path Problem. You can think of this interms of a map with a number of towns on it, and a number of routes between them. Given two towns, you have to find the shortest route between the two. Another problem of interest to home computer users, is the order in which to save a number of programs of various lengths on a tape so that the average recov-

ery time is minimised. The answer is that the

programs have to be sorted so that the short

test is saved first, then the next shortest, end-

ing with the tongest une it is obvious bill it si

Perhaps the most famous problem is the

Travelling Sweeman Procent A sale-man

has to visit a number of places in a given

area. You have to tell him in which order to

rake? val tomamie he me aken

If we he knapsally probed which sia

selection problem (selecting the object

While Art Rife , we promise a

not very easy to grove half sisc

Travelling salesman

permutation problem, which will be harder to solve because there are nil different permutations of niobjects. This is (as far as a computer is concerned) a very difficult problem. We thought that the bubble sort was slow taking a time proportional to nf. The best algorithms for the Travelling Salesman are even worse so that an algorithm which sorts out a problem for nipoints in 1 second, 2n points will take 8 seconds. An will take 2 minutes and 10n will take over 8 hours.

One way we can improve the time of an algorithm is called divide and conquer. Say we want to search a set for given record. If the tems are in a random order, we will have to start at one end and look at each record untiwe find the one we want. If there are nine cords, the average number of comparisons will be n/2. However, if the items are sorted into ascending order, like a dictionary or telephone directory, we have access to a much more efficient method called a Binary.

1000 Lal Hah

1010 IF L > H THEN 1030

Binary search program

.020 M = INT (L+H)/4

.DFO IF R C A:ME THEN HEH I REM CHOOSE BOTTOM HALE

.030 IF F) A(M) THEN HAMAL REM CHOOSE TOP HALF

OHO RETURN REM A M IS HE OF UE LA .

.050 Ma-1 RET PN REM TTEM DOES NO. EI

Search

We start by dividing the data into two parts. by looking at the middle element. If that is higher than the one we want, we know we can ignore all the records in the top half of our set. because they will be higher still. This means the record we want is in the bottom half. We now have a set of rt/2 records, which we divide into two in exactly the same way, which harrows down the search to a set of n.4 items. and so on. At each stage, we eliminate large numbers of records without even looking a. them! A binary search on nitems makes logn. log2 comparisons so if we have 1000 records, we can find the one we want in 10. compansons, compared with an averge of 500 by the simple method in fact in contrast to the bubble sort the binary search is the fastest known algorithm of its type, and yet it makes quite a small BAS C program.

Divide and conquer

Many sorting algorithms, such as MERGESORT and QUICKSORT use the principle of divide and conquer. Instead of sorting nirecords, we split them into two sets of ni 2 records. Each of these is split into haif and so on until we get down to a very smaintimber of records in a large number of sols. We can now sort each set separately (using a sort such as the insertion sort which is very last for small numbers of items) and then merge the sets together. Merging is an oper ation which is very quick, so we would rather merge than sort.

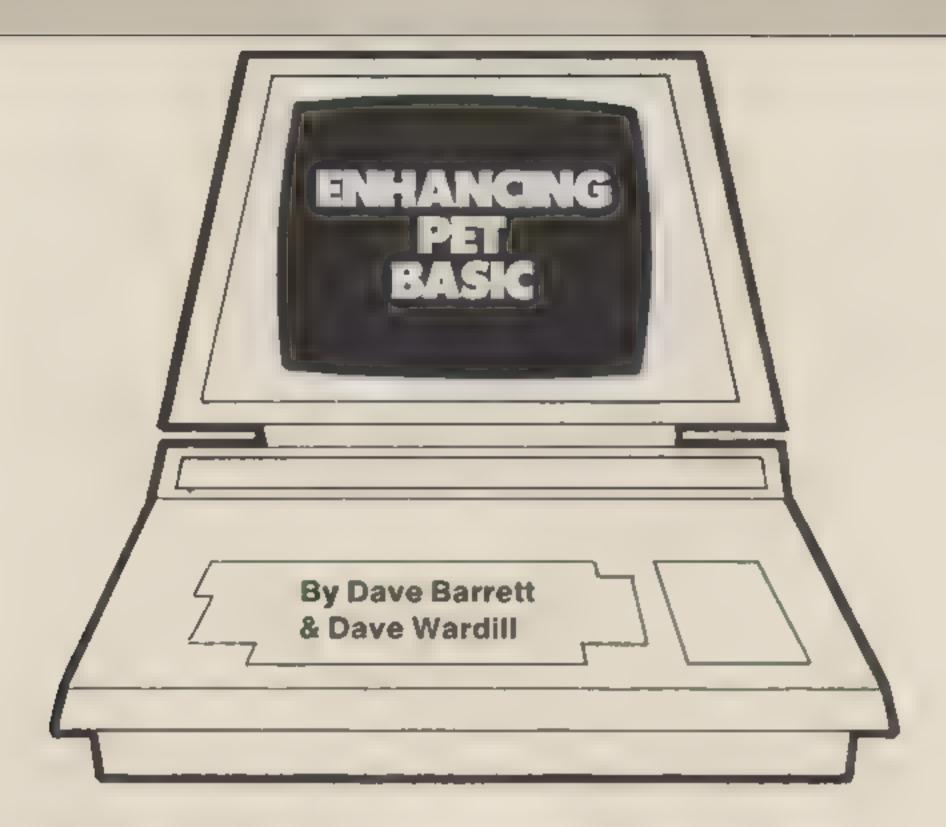
We have looked at a fair sample of the argorithms which have fascinated computer scientists and mathematicians for the past two thousand years. You may be interested to know that there are still many problems for which no efficient algorithm is known, such as the travelling salesman problem. Before we draw a discrete ver over the subject here are a couple more interesting problems.

The Postage Stamp problem where we magine a country which has n denominations of stamps but only mistamps are a lowed on each letter. For example, if n=4 and m=5 then stamps with values 1, 4, 12 and 21 allow postage values 1 to 71. The problem is, for every hand mitrom 1 upwards to find the values of the stamps which give the largest range.

The Eight Queens Problem. You have to place 8 queens on a standard 8 by 8 chessboard so that no two altack that is no two may be on the same row column or diagonal. This can be expanded to the general case of putting niqueens into an niby ni Equate chessboard.

Properties article has whelted a lew appetites aroused a bit of curiosity and also given a few hints on how to produce taster all gorithms. Unfortunately, many of the more powerful techniques require certain tools which we have no room for here such as bit nary trees and graphs. These are not tembly difficult, so if enough of you write in and request more, maybe the Editor will capitulate and run this as a separate series.





Last month, we explained how you could add a collection of new words to your PET. They would be recognised in your program, or as a direct command, with no loss of time or compatibility.

This month, we are going to look at one of the words in more detail. You will be able to add this to your BASIC vocabulary, if you wish, or you can treat it like any other machine code routine and load it into RAM when you need it.

Keyinput

We called the word KEY NP

The way it works is seen thost easily from an example. Suppose you have written a menu driven program of similarity. On the screen there is a confident list of options like this.

EGIN A NEW FILE
CHAPGE A RECOEL
FIND A FE FI
FEAL A FILE
FN

PRESS 78.4.F.R or E7 TO CONTINUE

So far so good but the menu is then probably checked with some awful looking segment of program like this (There is no doubt a more efficient way of writing this but why should we spor a good example just ries a strate)

00 GET B\$ IF B\$=" "THEN 200 210 P 0 F B\$= B* THEN P=2 130 F B\$="C" THEN P=3 M0 F B\$="F" THEN P=4 250 F B\$="R" THEN P=5 160 F B\$="E" THEN P=6 270 280 ON P GOTO 200 1000 2000 3000 4000 5000

Ar this rigmardie can be replaced with a much simpler

200 A\$ = 'BCFRE 210 KEYINP A\$ B\$ 220 ON PL% GOTO 1000 2000 3000 4000 5000

So what sit doing? KEYINP has to have three

alled with it. The first one AS in the
a string which contains the allowed keypresses
entally if you want the STOP key to work at this
have to include it in the string. That is guiteleasy
but type the string press the stop key as one of
the string press the stop key as one of
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the string press the stop key as one of

The second variable B\$ in the example given above is a single character variable. After KEYINP has been used if the character of the key which was pressed.

The libit dvariable Pt % is given a number by KEY NP

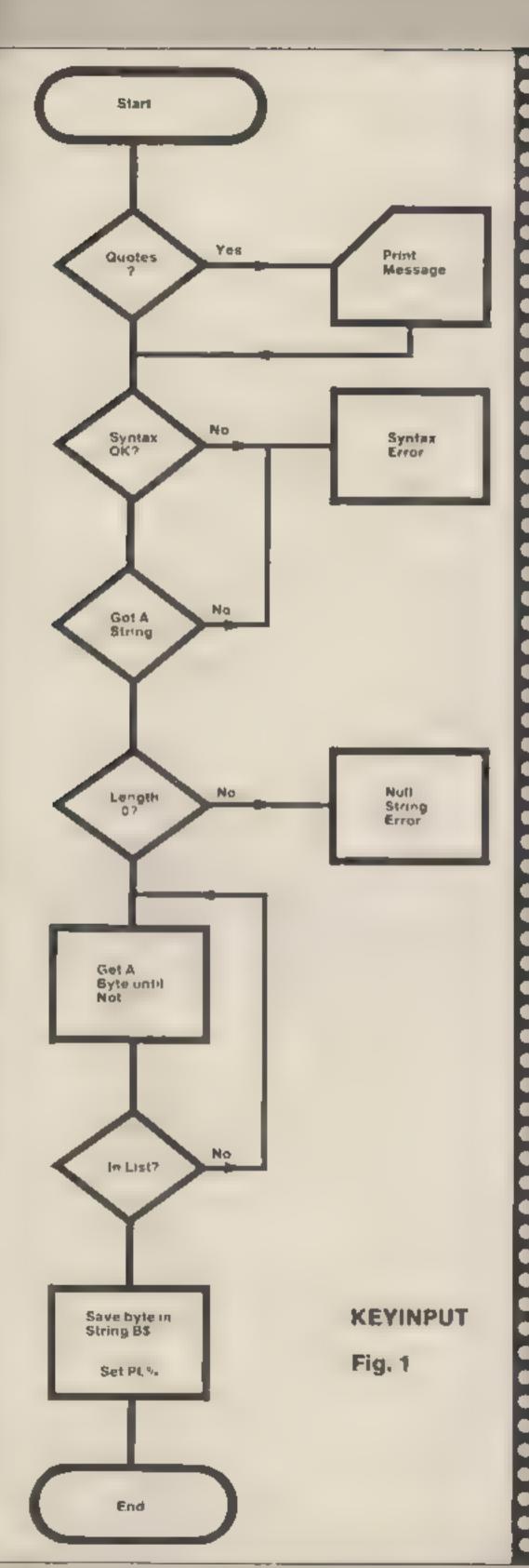
A high represents the position of the character in the

proved string. If you press the key which is the fourth

raracter in the string A\$, then Pt % will become equal to 4.

Therefore in our exempts of A\$, "PCERE" and the letter.

Therefore in our example, if A\$ = "BCFRE" and the letter



```
5 5 7 5 7 5 9 8
  the state of
  . pp.c
  d and
 24
848 707 848
an additional and a pro-
       ways other and secure to took
```

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the eare 9 different signs boards but only 6 different. Herson, Houghton, ie. Spring.

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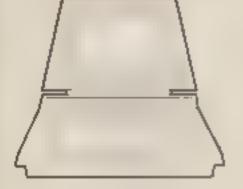
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AS = "BCFRE"

B\$="R" PL%=4 (fourth character in string)

This is obviously an extremely useful word. Not only will the piprogrammers who write menu-driven programs, but it could also revolutionise games programs of the genre 'Press any key to continue – NO NOT THAT ONE!

Refinements

The machine code program which defines the word KEYINP also contains one or two useful refinements.

For example, let us suppose that the programmer has forgotten to define the string A\$, which is the list of approved key presses.

When the program flow reaches that point, it will stop with a brand new error message

100 A\$ = 110 KEYINP A\$ B\$

NULL STRING ERROR IN 110

Suppose that the programmer wishes to include a message, like he can do with 'INPUT'. This is also allowed and it uses the the same syntax.

100 INPUT"WHAT IS YOUR NAME" NS

100 KEY NP*PICK A LETTER FROM BCFRE* A\$ B\$

Typical examples

Some typical examples of its use would include

120 A\$="ABCDEFG" 130 KEYINP"PRESS A NOTE" A\$.B\$

Or

180 A\$="ABCDEFG" 190 KEYINP"PRESS A' TO CONTINUE", LEFT\$(A\$.1).B\$

10

500 KEYINP"PRESS SPACE TO CONTINUE" (" ") B\$

Here, if a variable name is not used, the string must be in brackets

Flowchart

The flowchart for the word is shown in Fig. 1. The assembled program and HEX dump are in Fig. 2.

If you don't want to include it as a word in BASIC, but just want to keep it as a piece of code to be loaded when you need it, then all that needs to be done is this.

Type in the Hex machine code into the part of the memory where you plan to use it eventually. Make a careful note of where the routine starts if you are going to use a SYS' call—it is 15 bytes into that routine, as you will see

```
P#Park #

De MeReit

P # 7

E # 40 % 7
                                                                                                                   Mary Live
                           £455 €
                            Stante.
                            POSPH. 4
                                                                                                     #06. Y E #41875 B: CO YPM #

*FEM8.* Dt MEC* B: CO YPM #
    BE - PS.
                                                                                                    * 5 KEN PRESSED IN OUR LIBT OF ALLEWED CHAS
           中国企业的
   BED DO: 14
                                                                                                    # MORE D HE V
NO N E SPORT ABA /
1544F FOR PL
    144 460
ST SHARE
             . P.3 G.
             4 6
jab.
                                                                                                                                          AN AR E
           46 h 44.3
    5 a Lumber
                                                                                                                                                                                                                                         POG 1 DV .HR
                                                                                                                                                                                                                                                                                                                                                                 SN CHECK BY
       28 ($1 =
                                                                                                   THE THA CHEST PLASEN COLON
      THE THE B 18+3
                                                                                                    y and the property of the prop
 58 E A
180 S RD
98 S RS W
```

C# PC IRD SR AC XR YR 8780 E455 2C 34 3A 9D F6 3000 A9 99 A0 30 20 1D 4C BB 4C 93 BD 20 300B ED B3 68 00 C9 3010 RE 20 76 DO 08 301B 20 A5 30 A9 OD 20 02 E2 3020 20 CF C4 20 BO 30 A5 07 3028 FO E1 A0 02 F1 61 3030 00 88 FB A5 10 16 303B 20 F5 BE A9 00 A2 85 9E A9 3040 02 8D 01 02 40 3048 85 09 86 40 84 41 20 3050 C1 48 A5 07 F0 B4 68 3058 46 84 47 A5 77 A4 78 3060 48 84 49 A6 88 16 D1 307B 10 F9 30 EF 84 3080 BC A9 DO 85 42 43 20 87 C1 A0 00 3090 44 CB E6 19 A5 19 91 3098 60 4E 55 4C 4C 20 53 30A0 52 49 4E 47 00 20 B5 BE 4C 30AB A9 3B 20 F7 20 BB 30B0 C9 28 D0 06 20 E9 BE 3088 B5 C7 20 98 BD 4C 3000 AA AA AA AA AA AA AA

97

READY.

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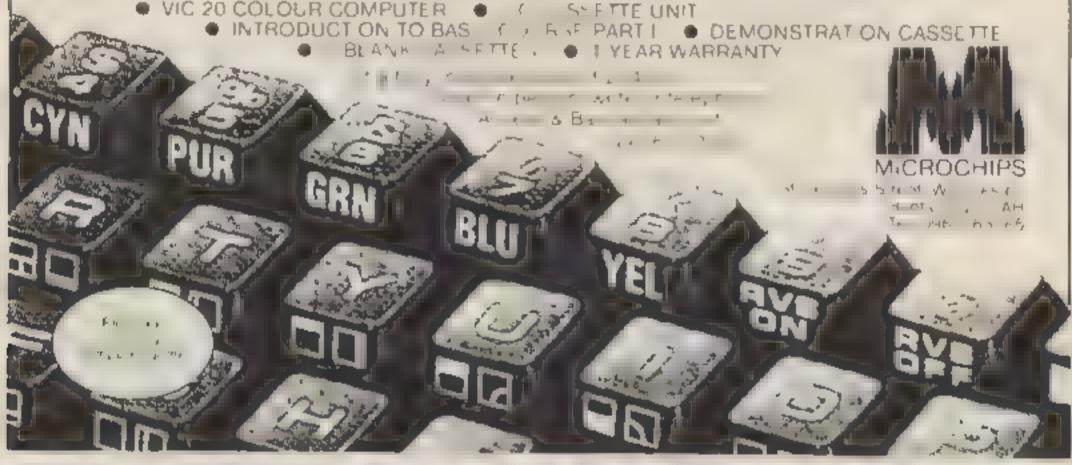
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- a beginner's guide to Silicon based life forms

Great - but what does it do?

A good question and one which every first time buyer of a microcomputer is well justified in asking. The shop assistant will immediately respond with a mind bogging list of possibilities from controlling the environment within your tropical lish tank to printing out your Christmas cards and addresses. Everything he says will – within some limits – be possible but often not practical. You can already control your fish with a thermostat (price three guid) and which of your friends would like to receive a computer printed envelope during the festive season? Christmas cheer in gas bill print does not make for personal greetings!

After five minutes of istening spell bound to the enthusiastic outpourings, you will be more confused then ever before. The best question to ask is the more obluse one Yes, but what doesn't it do?' This will normally result in a meaningful sitence. The thought has probably never occurred to the shop assistent that his golden dream machine may not be able to do everything Is not his fault. With the piethora of dazzling. machinery available, the claims by each manufacturer for the brill ance of their product are designed to calch the eye of the purchaser and isometimes, to numb him into submission. When the microcomputer boom hit the United Kingdom five years. ago, there weren't too many machines. about so there wasn't too much confusion. about which machine to buy. There was however total confusion about what to do with it once you digot it home. There still is And now that there are so many machines available, the confusion is all the greater. Which is why this magazine spends much time trying to clear a path through the jungle

Strange encounters

You it have read elsewhere in these pages some very sound advice on what or why to buy and there are always reviews of the latest sill con beasts to emerge from the forest. But some of you will no doubt ships.

leel lost by the sheer range of products available. The computer jungle is full of some starting creatures and, because of the commercial pressures facing the manufacturers, the jungle is also full of misinformation, industrial confusion and predators eager for your trade. It is also a jungle where evolution runs at high speed indeed, in the time you've taken to read this article, Science will have advanced by a couple of minutes in a technical laboratory may have led to a new and dramatic technological breakthrought Yesterday's computer may already be a dodo.

There is also something very sobering to bear in mind about the speed of the evolutionary process. Every machine in the shop window is technically out of date. The next generation is being born on the industrial test-bench right now.

So what to do? Well, you can always take a guided tout around the jungle. When expecting a series of strange encounters you should always be prepared. Here's a handy survival guider don't venture out alone without it.

COMPUTUS AGRESSIVUS

Mostly arrives with piles of publicity and mind boggling statistical claims. In the past the publicity leaflets were often better printed than the manual of instructions. This was because the sales and marketing.

departments in various firms never spoke to the development and engineering teams so they didn't have a clue what the machine could really do. Of course, all that s. changed now. They speak to each other but since the marketing people aren't computer. trained they listen but still don't have a clue what sigoing on. Well incli completely true of course. Thankfully COMPUTUS AGRESSIVUS is becoming extinct but watch but because they occasionally fall out of the treas and gobble you up lits hallmarks are the exciting tooks, flashy linish and very new tag. Remember that the reason it is exciling is because it is new. A 'sheep in wolf's clothing, will not only emply your wallet, it may leave you too confused to progress beyond discovering where the mains switch is

COMPUTUS "HI-SPEED" TEKNOLOGIUS

A modern descendant of COMPUTUS
AGRESSIVUS It is, by reason of its it
SPEED' name, quite a rare creature. The
wave of publicity material and adverts
abnouncing its imminent arrival are
somewhat in advance of reality. When you
read about this beast, it seems to be the



answer to many of your problems excellent specifications, amezing facilities and a nice low price. But can you find it? No. no one's seen it. The reason is that the demand for it somewhat exceeds supply in some cases it hasn't even been born yet. Because it is such a sought after creature, COMPUTUS "HI-SPEED" has developed unique evasion tactics and prides itself on being hard to track down it can be recognised by the following replies to your enduries.

"Oh no Sir, we're still waiting for it. We had one in last week but the boss took it home."

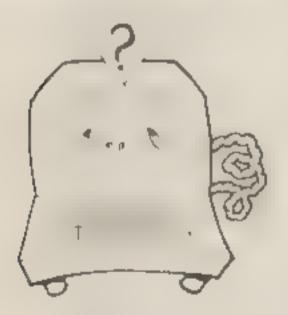
(sugh) "You must be loking, Sir. There's a six month waiting list!"

Or

*No. Sir, built ve got a friend at the factory and for a small extra fee. *

Although it's a victim of advance publicity this beast is obviously a good buy it everyone seems to want it too, then it must be pretty special N.B. If YOU can find one do let me know where you got it from

COMPUTUS INCOGNITUS



If you tell anyone else that you have one of these, the reaction will probably be: "What make? Sorry, never heard of it." This needn't

matter since it might give you a psychological advantage NOT to be part of the crowd. You can also impress your friends by claiming vast powers for the beast since no one will be able to know anything about it to argue with you. However with the rapidity of current commercial pressures, the company that made it may well have gone into figuidation. If no one's heard of it then that's probably the reason. This could be bad news since spare parts will only be obtainable from Borneo every second Trursday and software for the creature will be non-existent Friendly and no doubt lun - if you can find any instructions to make it work at all - but not really a sound investment particularly if you want to add things to it later

COMPUTUS SECOND HANDUS

Also known as COMPUTUS
PARTEXCHANJUS. This is a growing breeft for obvious reasons. You can find them at the back of shops and in all the magazine small ads. Like a secondhand anything, the problems are fairly obvious. It depends what has happened to the thing before it got to you. It it has been well treated then you should suffer no great loss. The best secondhand machine to buy would seem to be the one in the following small ad.

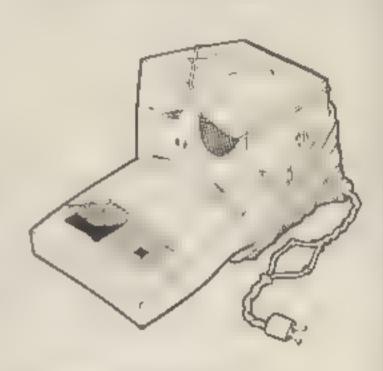
"For sale XXX 999 for \$100 00. Owner can't get to grips with it. Take \$50 00"

This means that the machine has been sitting idle for a month or two white the owner despaired of a reckless purchase

The disadvantages are that there is no guarantee, the machine is definitely out of date and the owner's call might have done something awful on it. If it is like COMPUTUS INCOGNITUS, then the problems of spare parts and add-ons' will apply. Software might only be available from a P.O. Box in

California which was last operational in 1978. Also check the price carefully. You might be able to get the same facilities on a new machine for the same amount of money.

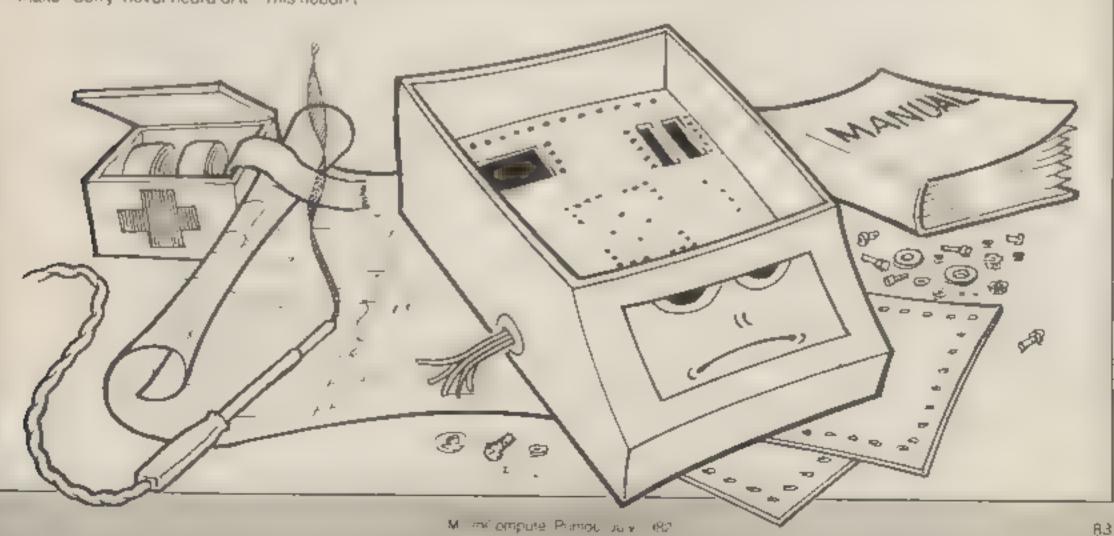
The best clue to the machine's wear and lear is to examine the keyboard of the letters and numbers are faint and worn then someone's been giving it quite a bashing!

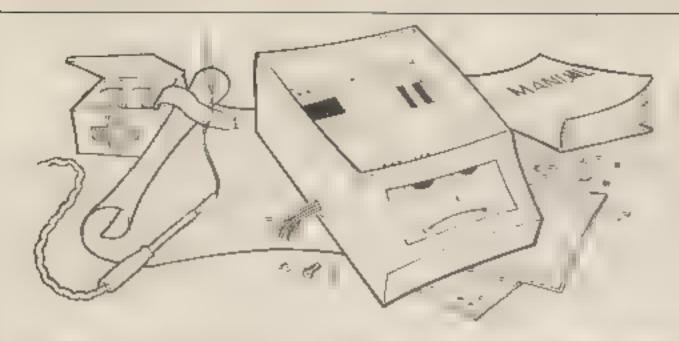


COMPUTUS 'DO IT YOURSELFUS'

These have been around for some years. and at one time were the only way to get into amateur computing at ai. People who build their own systems either from kils or from bits and chips lend to be very proud of what they ve achieved - and quite rightly too. The very idea of wielding a soldering. iron anywhere near high technology chips is to me - quite terrifying so I admire their. bravery as well as their sk is. Proud of their work they may be but they might not be so proud of their machine a achievements COMPUTUS DO IT YOURSELFUS & usually pretty limited in its scope since the really advanced computers of today don't normally lend themselves to home construction

Although some kits are surprisingly simple to build others may be too complex for the average constructor even to look at Lines, wires, connections and boards can make the circuit diagram about as





meaningful as Crapham Junction in the rush hour. Fun (wer sort of) and certainty a challenge but stear clear of this one. I you value your health sanity and sleep. Today's technology is so complex that the slights slip will ruin your work. And very few people will be able to tell you where you've got your wires crossed. Furthermore, the price of the signal and the price of

attempt your own construction

Hy has a

A definite NO - unless you reinvolved in educational research or have masochistic

General Classification of Silicon Based Fauna and Flora

There are two basic types of Silicon life forms. One is designated "SEPARATI UNIT and the other is "ALL TOGETHER IN ON!

former where the creature's heart is contained within a keyboard unit and all the rest of the bits (cassettes, TV disks, etc.)

particular advantage about either type iit all depends what you are going to use the thing for You should bear in mind the

(a) It is easier to carry the beast if it is along one box

(b) The more connections there are the

house will a ways want to watch "Dallas" or Top of the Pops

...And in conclusion...

Marty of the rules governing the purchase of logs, cats and budg as also apply to he in based ife forms. Having the just of choice of breed, if you re not really sure you really want anything but would like to dabble a bit, then don't buy a tropical anger fish. Get a goldfish which will be cheap and cheerful if you get fed up with your friends will be happy to take it off you but they won't be geared to take more explicitly at the cheap and cheer and the cheap and cheer and the province of take more explicitly at they won't be geared to take more explicitly at the cheap and cheer and the cheap and cheer at the cheap and cheer and the province at the cheap and cheer and the cheap and cheer at the cheap and cheer and the cheap and the c

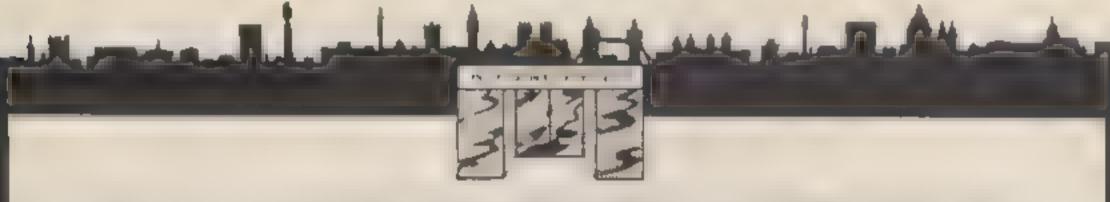
If you are aware of some of the possibilities your purchase will give you then don't

y y want a guard dog then don't get a Chihuahua You'll regret it ater

Castly if there is one general rule I would

training. The more animal of a particular type there are the more owners clubs and advice there will be Food (software, will be





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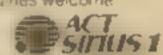
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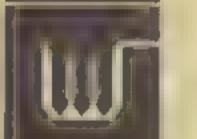


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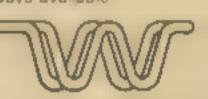
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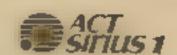
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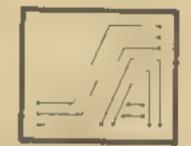
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What he was the EH LUMBER TYS

previously bought your Cassette. One and consider 1 to be good value for

Richard Ross Langley Manging Dr. 1 War

CASSETTE 1

(eleven 1k programs

Machine code:

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Klingon mobility, and graphic photon torpedo fracking

PRINCESS OF KRAAL An adventure game BATTLE Strategy game for 1 to 4 players KALABRIASZ World's silliest card game full

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30 TIC-TAC-TOE (Basic) Played on a 4x4x4 board this is a game for the brain. It is very hard to be the inniputer an

6 of the 7 games are in machine code, because thin-Buch taster than Basic (Some of these James were Cassette 4 costs \$5

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ROMNYS TIPS

This month I thought I'd take the opportunity to catch up on some of those heavy technical queries which you longstanding PET owners insist on bombarding me with. The Editor, who doesn't qualify for the label 'long-standing, hardery on account of his particularly potent homebrew), tells me that I mustn't favour PET owners so I promise a good spread of general queries next month. After all - it is the time of the PET Show

By the way, I shall be at the forthcoming PET Show, buzzing around looking my nose into other people's business. If any of you intend coming to the show, why not took me up. I would be glad to buy a drink for any of my faithful readers. Oh dear, the Editor has just told me that this issue will not appear until just after the show. What a shame

Aide memoire

Dear Tommy

I store data by POKEing it directly into the free memory area. of my PET I would like to be able to SAVE to, and LOAD from my cassette unit under program control. I have found this very difficult to do. In fact, despite disassembling most of the PET's operating system (and understanding precious nttle of it) I have not yet fathomed out a method which does not cause it either to crash or jump into the Monitor

T Halchell

Try this I II e routine

45 POKES12, PEEK (42) POKES13, PEEK (43)

40 PORE42,52 PORE43,4 50 PORE40,32 PORE41,4 -- "E"TEST" PORE40 1 PORE41,4

60 POME42 PEEK (512) POME4 FEEM 5

suppose you would like an explanation of how this works? I wish I were a magician so that I could just pub programs full of mysterious PEEKs and POKEs out of a top hat without people saying "Yes, but how does it work?" It is in fact a lot easier once the method has been pointed out

When you LOAD a program from tape or disk in the middle of another program, it is loaded back into the part of memory from which it was saved, and none of BASIC's pointers are altered. Our problem is how to SAVE the area. of memory in the first place. In your case we are using . OAD and SAVE to store data rather than a program, but that does not matter. When you give a SAVE command. BASIC saves the area of memory defined by a start of program pointer, locations 40 and 41, and an 'end of program pointer, 42 and 43. So to save an arbitrary area of memory, we need to save these two pointers, set them to point to the memory area, perform a SAVE, and then restore the onginal pointer values. In fact, the start of program, pointer in 40 and 41 is always 1025, so we do not have to save this. Line 35 saves the end of program pointer, and line 40 sets it to the end of the memory area to be saved. Line 50 sets the start of program pointer to the start of the memory area, performs a SAVE and restores the start of program pointer. Line 60 then restores the original end of program pointer and the program will then continue quite happily. To load the saved data again you can just say.

120 LOAD"TEST"

and the data will reappear in its old location just like magic One thing you must be careful not to do is to try to use variables in between lines 35 and 60. In other words, the size and position of the data area are fixed

TIM Tip

Dear Tommy

I have come across references to the 'TIM' monitor in new ROM PETs which helps with machine language programming. Could you tell me where I could find information on the TIM monitor?

PR Mayes

I am afraid that TIM isn't much use for serious assembler. programming. All the information on TIM you are likely to need is in the Commodore manual in the chapter on Machine Language programming. The only facilities the monitor possesses are to display and after memory locations and the 6502 registers, load and save programs execute an assembler program and return to BASIC. If you want to do any serious work in the line, Commodore do an Assembler Development System which is much more powerful

Wait for it

M. Potchett

Dear Tommy

I would like your magazine to run an article on the WAIT statement. The manual for my machine is not very clear on its usage. The only WAIT statement I have come across so far is WAIT 59410,4.4 which waits for the space key. before continuing. I have used this statement in a program which displays pages of text, waiting for the space key after each one. Sometimes a page or more is missed out. Is this because of key bounce, and if so, how can I prevent it?

The WAIT statement is intended to be used to hand a I/O operations, and it tests the status of individual bits in a memory location, normally an I/O port. In order to find out how the WAIT statement works, it is necessary to understand the togical operators AND and EOR. A good explanation can be found in the series. "Hardware - how it works"

The format of the WAIT statement is WAIT J K. I is the memory tocation to be tested, and J and K are values between 0 and 255 to be used in the test. What the WAIT statement does is to read the value of the memory local on I, performs an exclusive—OR with the value of J, then performs an AND between the result and K. If the result is non-zero then BASIC continues, otherwise I repeats the test. In the case you gave, the space bar appears as bit 2 in location 59410, so if the space key is pressed, that bit in 59410 becomes 0. When exclusive-ORed with the 1 in bit 2 of the number 4, we get a 1 in bit 2 of the result. When this is ANDed with 4 (to cut out all the other bits in the word which will also be 1), we get 4, a non-zero result, so BASIC carries on if the space key is not pressed bit 2 of 59410 contains a 1, which when exclusive-ORed with the bit from the number 4 gives zero. Zero ANDed with anything gives zero, so the WAIT statement waits

Contents of 59410 EOR with 4	Space Pressed 11111011 00000100	*Space not pressed 11111111 00000100
Result AND with 4	11111111 00000100	11111011 00000100
	00000100 continue	00000000 wait

That's the theory out of the way. I personally do not like the

use of the WAIT statement to test for the space key. What is wrong with this

100 GET A\$ IF A\$ = " "THEN 100

WAIT 59410.4.4 does not work on the 8000 PET, does not filter contact bounce (as you suggest), cannot be broken out of by the STOP key (which may not be a problem when a program is installed, but is a nuisance when you re testing) and ast but not least it is harder to understand Having said at that though I do not think that contact bounce is likely to be affecting your particular program, because by the time you have displayed a page of data, any contact bounce will have died down, and also, you would see the data flash on the screen before being overwritten by the next page, although it is just possible that this is the problem if you are only printing a couple of lines on the screen. On the other hand there are many situations where contact bounce could cause problems, and in these cases the use of GET is a must

Nasty Little Bug

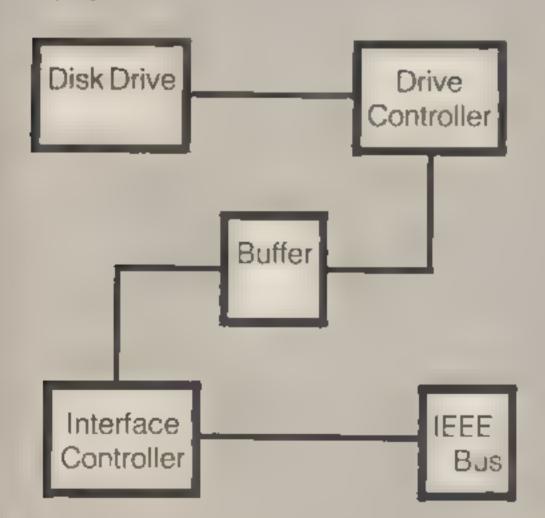
Dear Tommy,

I am writing to ask if you can help me out with what I see as a nasty little bug lurking about in the PET computer

I am a little perplexed that whilst, for instance, directly dumping on the printer information held in the form of a sequential file on disk, the disk stops revolving for about 30 seconds, and then decides to continue as if nothing has happened

Also the computer 'freezes' whilst against printing to the printer directly from an array in memory. I have noticed, however, that if one uses LEFT\$ in association with formatting and padding, the computer sticks during printout more than if one uses MiD\$ for the same purpose, and sticks even less often when one uses the TAB functions. Lionel H. Doy

What you have noticed here is in fact caused by two different effects, neither of which is a bug. Your first query is about the disk stopping every so often when reading data and then printing it. Let us have a look at how the disk drive works. We can draw a simplified diagram of the disk drive keithis.



The Disk Drive is the actual drive unit which you put your id skette into. The two Controllers contain a microprocessor each, which make your disk drive more intelligent than the PET! The Buffer is an area of RAM in the disk drive used to hold data from the disk drive until it is required by the PET. Data is read from the disk drive by the Drive Controller in blocks of 256 bytes and stored in the buffer, from where it is read by the Interface MPU and fed to the IEEE bus and so to the PET in response to your NPUT # or GET # statements

When you have read at the data from the buffer, the interface Controller sends a message to the Drive Controller asking it for some more data from the disk drive, it enough time elapses between these requests, the Drive Controller turns the drive motor off to save wear and tear on the disks. Now compared with the speed at which data is read off the disk (which for a typical double density disk drive is around 250 kbits/second) even a fairly fast printer is slow at say 180 characters per second, so the disk drive motor stops quite regularly to let the printer catch up

The other effect is our old friend 'Garbage Collection', which arises whenever you are doing large amounts of string handling, and using large string arrays. As my learned friend Uncle Costan dealt with the matter admirably in October, I shall refer you to that for a full explanation.

The reason that your program works more quickly using MID\$ than LEFT\$ is that it happens that in this case MID\$ generates less garbage. Another program in ght work more quickly the other way round. The TAB function does not produce any garbage at all so is much better! By the way the new 4000 and 8000 series PETs uses a much more efficient method of garbage collection which is so fast it is almost undetectable. You can get the advantage of this by upgrading your PET by buying a BASIC 4 upgrade ROM kit provided that all your existing software will run under BASIC 4. The software supplier should be able to tell you if it will

Elephantine Memory

Dear Tommy

I have an 8K PET which has been upgraded to 32K, and I am wondering if I can buy some extra memory to increase the PET's capacity to 64K. Is it possible to replace the existing memory chips with larger ones?

P Truscott

I am afraid that the answer to both your questions is no. The problem with increasing the memory capacity beyond 32K. is that the top half of the 6502 address space, from 32 to 64K, is rargely taken up with screen memory, I/O chips and the BASIC and operating system ROMs. There are a few vacant slots (the exact number depends upon which PET you have and whether you have any add-on goodles like the Toolkit filled), but these are intended for extra ROMs. To fit any extra memory you will need to know quite a lot about the hardware. You cannot replace the existing RAM chips with larger ones. If you have a 1K chip, for example, there will be 10 'address lines', which are used to select one of the 1024 memory 'cells' in the chip (1024 being 2 to the power of 10). A 2K chips will need an extra address line, as it has twice as many cells, and this will not be provided on your machine

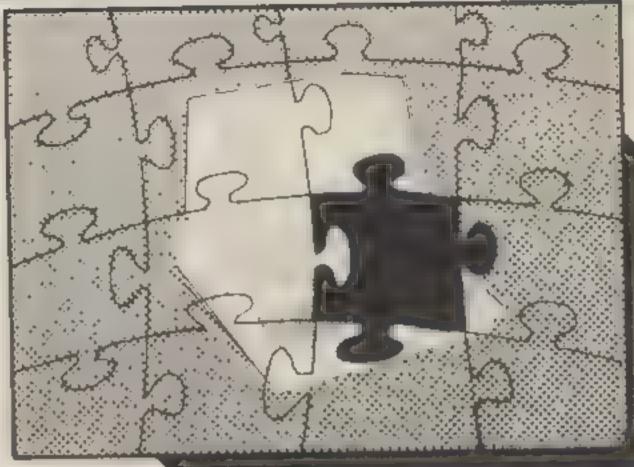


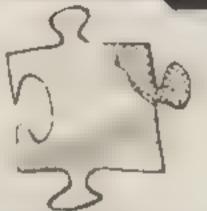
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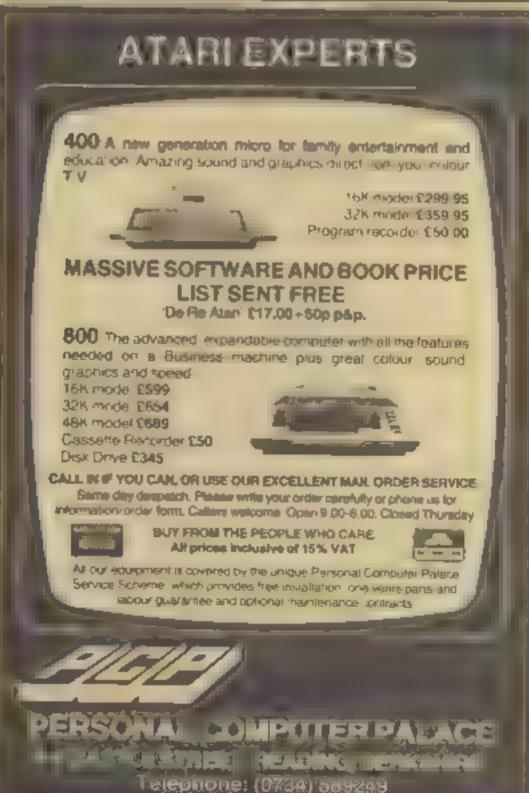
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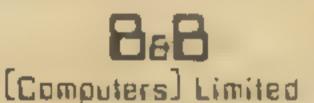
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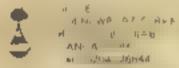


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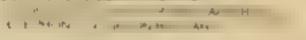




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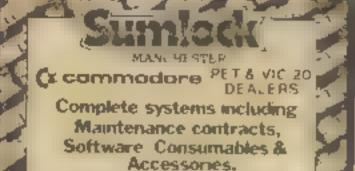


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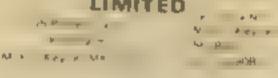
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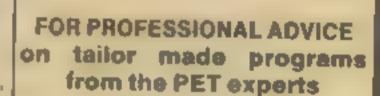
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300 F=R*.01:FORJ=OTOY:DF(J)=(1/(1+F))*J:NEXT: R=INT(R*100+.5)/100:RETURN

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34 TREALITY

his Atarl just two years ago. Before then, he had no programming knowledge or experience whatsoever, 6 months later he sold his first program, and 12 months after that he'd done "My First Alphabet" which immediately won first prize in Atan's APX for that quarter and then scooped the \$25,000 pool.

The program is intended for young children and draws the most amazing pictures on-screen, accompanied by music. If the child hits the right key for the initial letter of the object in the picture there's a musical reward and another picture. The wrong key produces a gentle disharmony and an invitation to try again.

My test kids loved it!

I've tried it on lots of kits, some of them handicapped, and it's been a pleasure to watch them use it and a winner with them all. If you have a young family, get it and treasure it, for it's a five-star piece of programming

Unhappily, it's only on disk (because of the random access required) but it only needs 24K so there should be no memory wornes. The £22.50 price shouldn't bankrupt you either.

And that brings me neatly to the final word. in this article, I hear from Atari that they re running a special promotion aimed at encouraging a higher number of disk drive owners. The

plan is simple; buy an Alan 800 computer and get your choice of three free programs from the best of the APX catalogue, which can effectively knock some ten to twenty percent off the price.

An excuse to buy that drive

As this article appears, the promotion should be just about to start. This could therefore be the excuse you've been looking for to persuade the wife that you simply have to have that disk drive, rather than some of those boring old things for the house she keeps going

Certainly now that Alan have arrived in this country, there are going to be a lot of programs available for their computer. A lot will be from Alari, and many more will be those which, in ever-increasing numbers, are being advertised in the American computer magazines (always a reliable barometer to a computer's increasing popularity).

I'll be having a lot more to say about those independent programs in subsequent articles, because I've seen many of them and for the most part they're really quite incredible. I'll try to make sure you get the best, for make no mistake about it, the giant's finally arrived himself, he's here to stay, and it's no overstatement to say things aren't going to be quite the same again.

FINANCIAL MODELLING

The method used to swap information between these packages is quite neat, involving a method of forming all the files into a standard format called DIF for Data Interchange Formal This was developed by Software Arts, originator of VisiCalc, just to anticipate future products and make sure that they could interface with VisiCalc.

So VisiCorp is moving upmarket in modular lashion, while other products like Micro-Modeller are starting right at the top. And the luture? Micro packages handling bigger and bigger models at greater and greater speeds with more and more analysing features. squeezing the mainframe packages and bureaux services into a small comer of the very top and of the business Comshare's Pendse says he is not atraid of the micro versions of his company's gient modelling techniques "It's all increasing the public's awareness of financial modelling, and it's good for all of us in the business," he says. Sound familiar? It's just what the micro makers are saying about IBM's dramatic entry into the personal computer lists. We'll see, well see.

SINCLAIR SPECTRUM

played on the internal speaker. OVER is a method by which text and graphics can be overprinted - making possible vowels with accents, for example. The Spectrum has also been shown with a 40 x 25 Teletext compatible display entirely done in software. A good deal of programming would seem to be involved as characters are reduced to 6 pixels in width, and the subject is not documented. It does, however, open up some interesting possibilities for the future.

Documentation

The instructions are of a very high standard - there being two manuals. The 30 page introduction is for the complete beginner, and goes through very simple programming to straightforward colour and sound. The 220 page manual is a complete course in BASIC. It deals comprehensively with the most sophisticated features, and includes a considerable amount of technical information about memory maps and similar esoterica

Software was pretty well non-existant at the time of the launch, though Sinclair did make a concurrent announcement of their intention to move into software publishing

ENHANCING lifteenth byte.

BASIC 79 🐗

from the assembler listing. Aim to hit that '20' in \$300E.

When you are ready to use it, use 'SYSxxxxx' instead of KEYINP' where 'xxxxx' is the decimal address of that

If you have any problems with it, or if you want to swap any ideas, we will be glad to help if we can. Try Durham 711380, and we may be able to let you have Hex dumps to save you typing it in, or an EPROM if you want to go fully to the extra BASIC routines.

Next month, we will have a Sort routine for you, which works equally (and quickly) on both strings and on numbers.

for both models - starting with quite an impressive range for the '81. No doubt as with that machine, though, a large number of small independent companies will soon be lumbling over themselves in a race to develop the first invaders, Chess, Household Budget planner program (does anyone plan their household budget on a computer?) etc

All of which may leave you with the impression that the Spectrum is so powerful that there is hardly room for competition. Not

One weakness is still the keyboard. Though the Spectrum may well end up on the desidops of several small traders, it cannot really be expanded to full business. status in the same way as, say, the Commodore VIC 20 can

Secondly, though the graphics are

excellent, they don't match up to the Player/ Missile graphics of Atari - or "Sprite" graphics on Commodore's newlyannounced low-cost VIC-10. With no facility for plug-in ROM packs, the Spectrum is rather less than the bee's knees as far as arcade games go.

Finally, and paradoxically, the machine's very low cost could even turn out to be a minor disadvantage in terms of encouraging independent suppliers to develop quality peripherals and software for it. Well, who is going to offer a 5 megabyte hard disk for a computer costing £125?

No, cancel that last comment. Someone's bound to. And it could well be Sinclair himself. After all, it is only a few months since Inside Trader joked about a Sinclair Microdrive costing £25

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INSIDE TRADER

Fellow connoisseurs of Fleet Street hyperbole will join me in congratulating *Personal Computer World* Editor Petit Pierre Rodwell on his well advertised "World Exclusive" on the Sinclair Spectrum, which appeared somewhat alter reports in other journals (this one included). Nonetheless I think their great IBM "scoop" still wins by a nose; that one appeared a full month after ours.

Inflation appears to have struck Silicon Valley in a most improbably spot: the chip numbering departments. The original 8-bit microprocessors rejoiced in designations like 6502 and 8080. With the introduction of 16-bit C P.U.s. Zilog and Motorola raised the ante to Z8000 and 68000 respectively. Now lest anyone miss the point, the evermodest Jack Tramiel has ordered that Commodore's new (supposedly secret) 32-bit microchip be designated the 650,000.

A for effort to Ealing dealer Dave Whitehead of Adda Computers, for his latest sales idea – computer parties. If Tupperware can sell at parties, why not us, he reasoned. Atas Whitehead's first two soirces suffered disruption from a number of disappointed leather and latex enthusiasts apparently under the impression that computer dating, or possibly, mating, were somehow involved.

Riot and romance, mishap and mystery reigned at our Mid-Summer Ball. Why, for example, did Microsoft Manager and part-time policeman, Matthew Wauchope, get his face stapped in mid-smooch by the lovely Karen Chambers? The absent minded amorist himself remained in ignorance of his transgression until he discovered his truncheon in his pocket.

Congratulations to Burroughs on a neat solution to an awkward problem. To wit, what to do about a personal computer set to retail at the embatrassingly high price of £4000. The answer, and I quote, is that "the B20 is not a personal computer. It is a multi-function business criented workstation." Like the IBM, er. Personal Computer?

I see that micro manufacturers have now taken to reporting each other to the Advertising Standards Authority.

Companies recently to have featured in complaints to this toothless old watchdog include Sinclair and Commodore. Both are said to nurse a shrewd suspicion as to which of their peers was party to their embarrassment. A rash of unwarranted complaints are now expected against Another Purveyor of Personal computers and Like Equipment.

An entertainingly adminonious row is brewing between *Byte* columnist Sol Libes, doyen of computer freaks, and Silicon Valley gadfly. Hat Hardenbergh of Digital Acoustics Inc. The trouble started when Hardenbergh congratulated Libes on his news report that Chuck Peddle was working on the Sirius 1. The story, even after subtraction of *Byte's* famed four months lead time was then some ten months old. Libes is believed to be sending Hardenbergh a complete set of the ninety odd back issues of Byte, each of which weighs two pounds. Delivery will be by air – from a helicopter hovering 2000 feet above Hardenbergh's office.

I share Intertec's deep sense of outrage at Julian Ailason's impertinent, and no doubt libellous, suggestion that their SuperBrain might be less than 100% reliable. I am therefore suppressing the press release which announces the opening of a vast new maintenance centre near Slough. A spokesman is quoted as being of the opinion that SuperBrain repairs should be worth a cool £100,000 a year.

e, Atari and NEC d-checked prices

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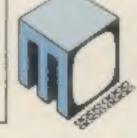
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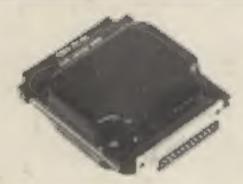
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